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2,4-D revolutionizes weed control!

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Widespread field tests in the past few years have proved that the application of 2,4-D (2,4-Dichlorophenoxyacetic acid) is highly effective for weed control in crops such as corn, wheat, oats, rye and barley, rice, and sugar cane. Not only has it been proved an effective weed control but it has also increased the vigor and yields of agricultural crops.

2,4-D is only one of a wide variety of agricultural chemicals, including insecticides, fungicides, germicides and rodenticides which are produced and marketed.

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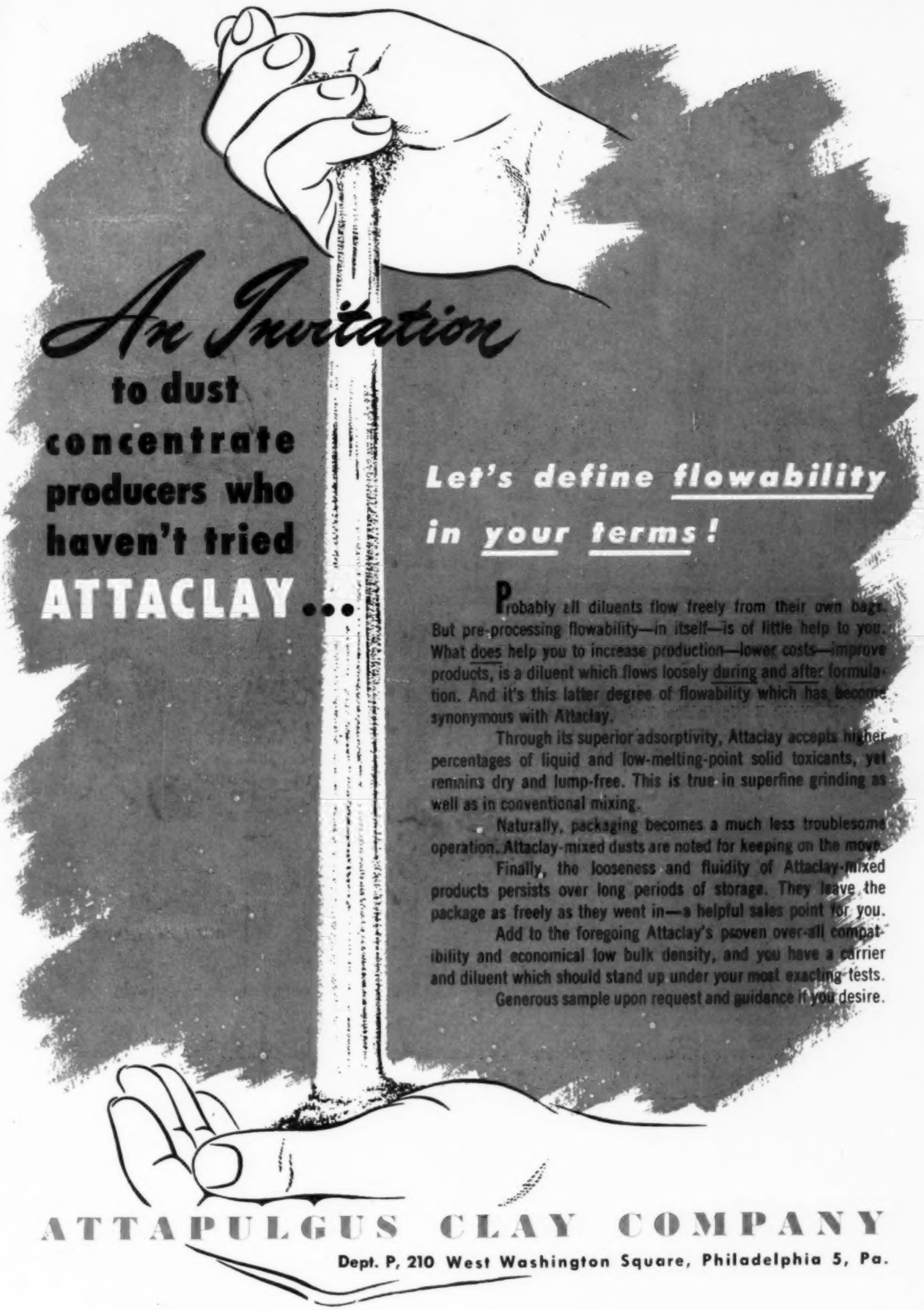

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Probably all diluents flow freely from their own bags. But pre-processing flowability—in itself—is of little help to you. What does help you to increase production—lower costs—improve products, is a diluent which flows loosely during and after formulation. And it's this latter degree of flowability which has become synonymous with Attaclay.

Through its superior adsorptivity, Attaclay accepts higher percentages of liquid and low-melting-point solid toxicants, yet remains dry and lump-free. This is true in superfine grinding as well as in conventional mixing.

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Generous sample upon request and guidance if you desire.

ATTAPULGUS CLAY COMPANY

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AGRICULTURAL CHEMICALS

THIS MONTH'S COVER

Use of chemicals in soilless gardening has developed into significant proportions. Here a group of Japanese workers are harvesting part of the first crop of radishes grown at the 8002nd Hydroponic Farming Depot, Chofu, Japan, some fifteen miles from Tokyo. (See complete article beginning on page 25, this issue.)

OCTOBER 1948
VOL. III No. 10

A Monthly Magazine For the Trade

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In This Issue:

AGRICULTURAL CHEMICALS

Subscription Rates: *One year* $3.00, *two years* $5.00. *Outside U. S. one year,* $4.00. *Published monthly on the 15th by Industry Publications, Inc. Office of Publication, 123 Market Place, Baltimore 2, Md. Advertising and editorial office, 254 W. 31st St., New York, 1, N. Y. Advertising rates made known on application. Closing date for copy—25th of the month previous to date of issue.*

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FOR YOUR INFORMATION

CAUTION

MUST BE STRESSED IN USING 2,4-D

By its powerful action in controlling weeds, 2,4-D is preventing millions of dollars of crop and garden losses each year... Yet, because of careless application, 2,4-D is becoming suspect and its use has, in fact, been restricted in some areas. This stresses the need for caution wherever 2,4-D is used.

To make it possible for our nation's farmers and gardeners to continue enjoying the benefits of 2,4-D in protecting their investments, manufacturers, formulators and field operators must share the responsibility for teaching and effecting judicious application methods. As an aid to proper application, Monsanto here suggests some of the precautions which should be impressed on all users—in literature, on labels, by verbal instruction:

Keep 2,4-D away from shrubs, trees, vegetables and flowers... 2,4-D is not harmful to man or to animals in the concentrations generally used, but many plants are extremely sensitive to even minute quantities.

Do not spray or dust 2,4-D in a high wind... Dusts and mists can easily travel many miles. Ester formulations are volatile and fumes may also be carried great distances. In areas where rice fields have been dusted with 2,4-D by airplane, cotton in fields 14 to 16 miles away has been damaged.

Store 2,4-D carefully... Open containers, spilled 2,4-D and contaminated handling equipment can injure or kill plants and seeds which are stored nearby. Keep containers tightly closed.

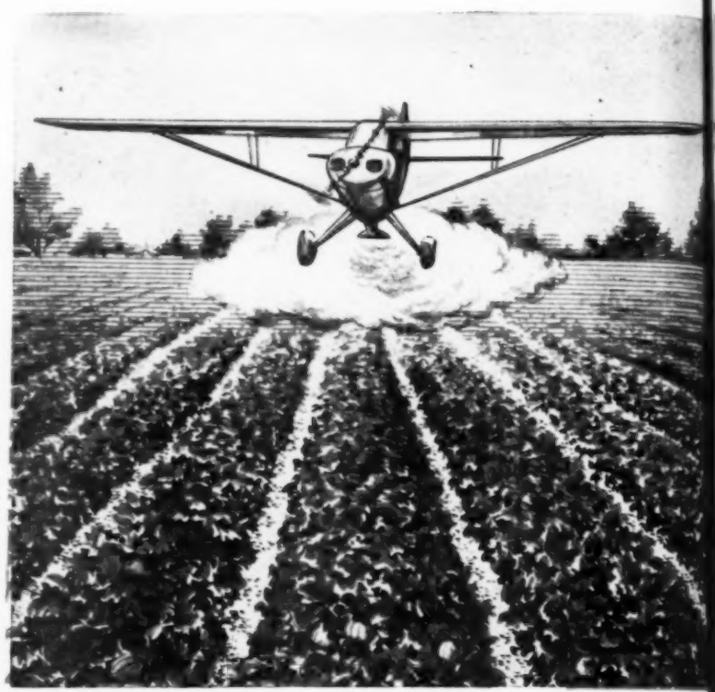
Do not use 2,4-D handling equipment for any other purpose... Scoops, sprayers, sprinklers and other equipment can retain harmful traces of 2,4-D even after thorough washing.

ORDER 2,4-D NOW FOR 1949

2,4-D formulators are urged to contract for their 1949 requirements at once, to assure themselves of adequate supplies. Monsanto 2,4-D is produced in three forms: 2,4-D Acid, 2,4-D Sodium Salt and 2,4-D Isopropyl Ester.

LITERATURE AVAILABLE

Monsanto Technical Bulletin O-50, "2,4-D for Weed Control," offers technical data and suggested formulations. A new 36-page illustrated booklet, "The Killers in the Field," covers the story of weed control in an interesting, informal manner. For your copies write or ask for them on the coupon.



NIFOS-T SCORES 100% KILL ON TWO-SPOTTED SPIDER MITE

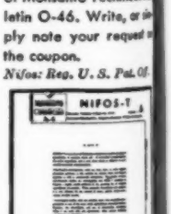
Successful field trials continue to prove the effectiveness of Nifos-T (Monsanto Tetraethyl Pyrophosphate, Technical) in controlling mites, aphids and insect pests... In a recent Arizona experiment, a 40-acre plot of cantaloupes was rid of the two-spotted spider mite (*Tetranychus bimaculatus* Harvey) in the following manner:

The field, with vines covering the beds and heavily infested with mites, was sprayed with a formulation containing about 1¼% of Nifos-T. Method of application was by airplane sprayer, using a rate of 10 gallons per acre. In observations made the following day (on inside leaves as well as on top and bottom of outside leaves) *only two live mites were found*— indicating a kill as near 100% as could possibly be expected.

This is further proof of the quick, complete killing power of Nifos-T. This outstanding characteristic, added to economy, lack of residual toxicity problems and ease of formulation, makes Nifos-T the number-one insecticide for the protection of many truck-farm, fruit and vegetable crops.

For latest data on Nifos manufacturers and formulators of insecticides are invited to send for a copy of Monsanto Technical Bulletin O-46. Write, or simply note your request on the coupon.

Nifos: Reg. U. S. Pat. Off.



News of Monsanto Chemicals for Insecticides, Herbicides and Fungicides . . . . October, 1948

IN THE HOME

SANTOBANE CONTROLS ANNOYING INSECT PESTS

Householders can easily rid their premises of destructive and disease-bearing insects by proper use of Santobane (Monsanto DDT) formulations. For this purpose, the most satisfactory methods of application are by sprays and aerosols.

Another interesting way in which Santobane is being used for the control of household insects is by incorporating the chemical in wallpaper at some stage of its manufacture. Paper, so treated, is reported to possess residual toxicity lasting more than a year. Also, Santobane-treated paper and paper bags for storing garments, blankets, carpets and upholstered furniture are being successfully used.

Santobane is available to manufacturers and formulators of insecticides for immediate shipment at competitive prices. If you would like complete information on proper formulation and application, write for a copy of the booklet, "Santobane (Monsanto DDT)." Ask for it by means of the coupon if you prefer.

Santobane: Reg. U. S. Pat. Off.

Some Household Pests Effectively Controlled With

SANTOBANE

(Monsanto DDT)

- American roach
- American dog tick
- Bedbug
- Black carpet beetle
- Body louse
- Brown-banded roach
- Brown dog tick
- Cat flea
- Clothes moth
- Crab louse
- Crazy ant
- Dog flea
- Firebrat
- Fleas
- Head louse
- House fly
- Mosquito
- Oriental cockroach
- Rat flea
- Silverfish

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The approach of fall and winter brings the need for rotenone for cattle grub and lice control.

The economic gain from livestock insect control is one of the outstanding achievements of applied entomology in the past two seasons.

We specialize and formulate particularly effective combinations. Why not address your inquiries for DDT and rotenone to us?

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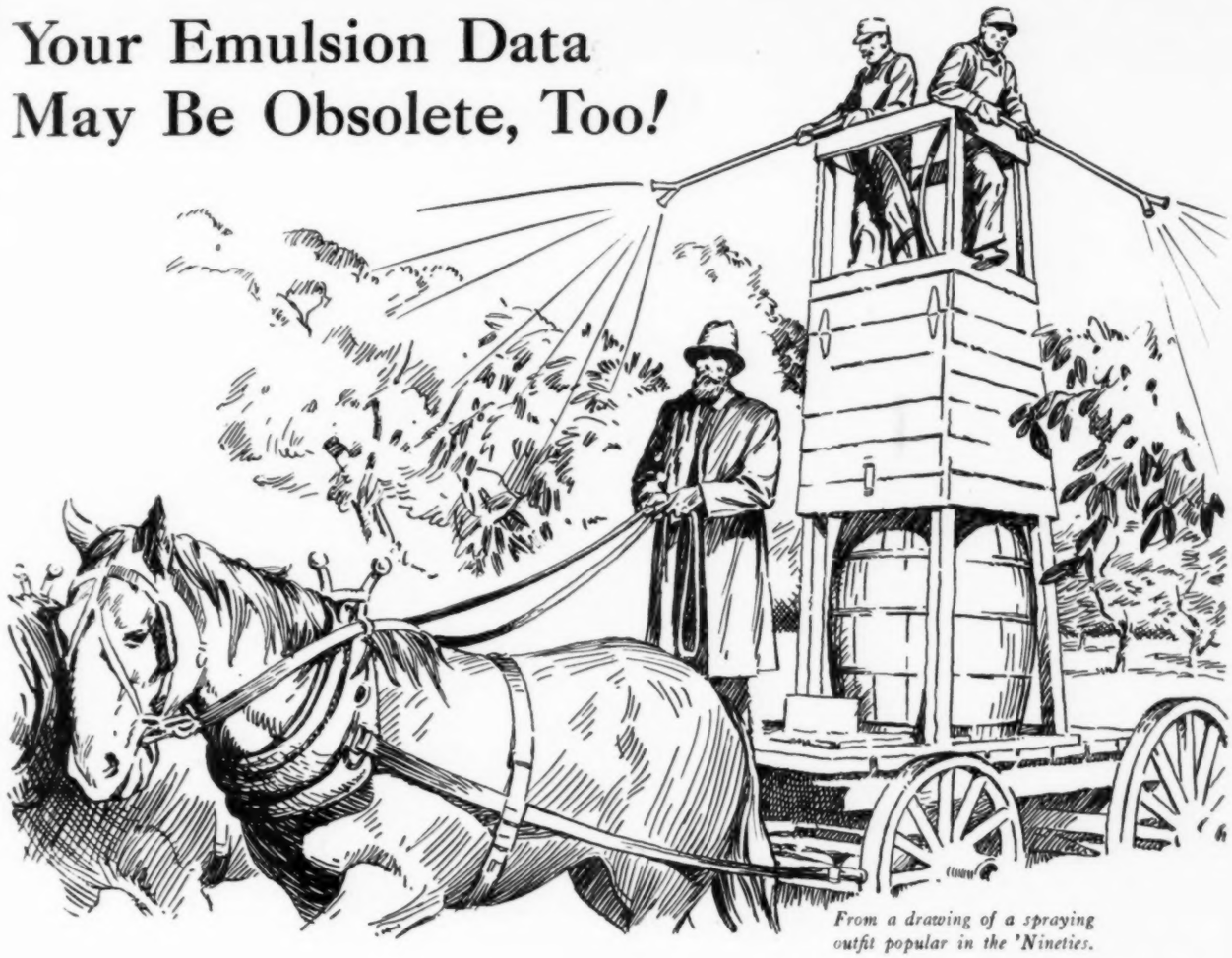
Your Emulsion Data May Be Obsolete, Too!



From a drawing of a spraying outfit popular in the 'Nineties.

Progress has outmoded much of the literature on emulsions and concentrates that is in circulation today. Even data published as short a time ago as three years may today be as obsolete as this spraying rig of half-a-century ago!

Within the past several years, tremendous progress has been made in emulsions and concentrates. New materials have become available to make possible vastly improved formulations for old toxicants as well as new.

Atlas has information available for you in an easy-to-read pamphlet. It is concise and informative—with the latest up-to-the-minute ideas on emulsions and concentrates. Write for your copy today.

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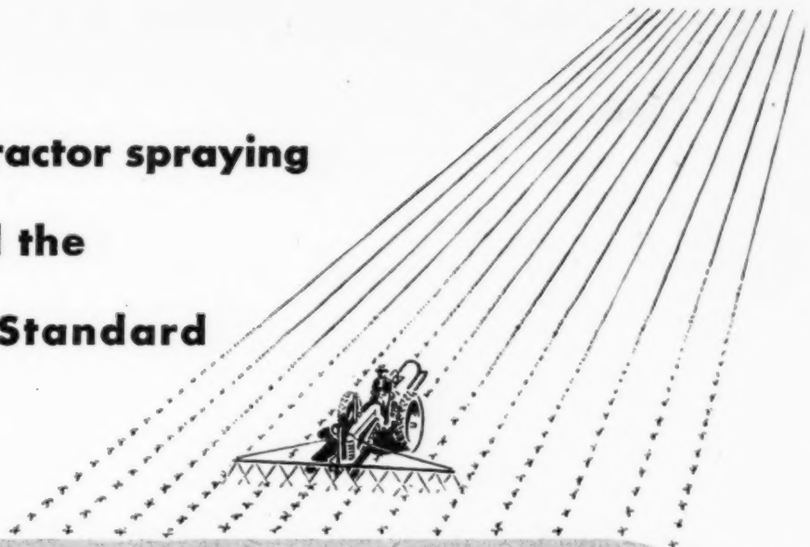
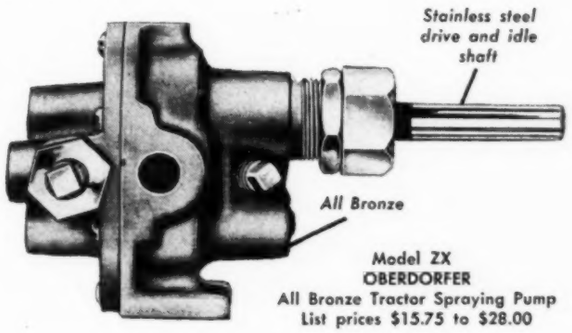


OBERDORFER BRONZE SPRAYING PUMPS

Almost every leading U.S. and Canadian manufacturer of weed spraying equipment used Oberdorfer Bronze Pumps in 1948—because these manufacturers knew that in the 51 years we have made similar pumps, no competitor has approached them for long life, efficiency, dependability and low cost.



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All Bronze Tractor Spraying Pump
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9. Backed by 50 years of bronze pump manufacturing.
10. All metal — no rubber.
11. From 2 gallons to 600 gallons per acre.

Today, no one can question the suitability of Oberdorfer Bronze Gear Pumps for agricultural spraying. The experience of tens of thousands of farmers has proved that they are just as efficient and reliable for spraying as they have always been in pumping corrosive liquids for the country's largest industries. This year's record on U.S. and Canadian farms has more than ever justified the recognition of Oberdorfer Bronze Pumps as *The North American Standard.*

We are now making Oberdorfer Bronze Pumps at the rate of ½ million a year, but even this vast production may not be sufficient to fill the 1949 demand. Place your orders for Oberdorfer Pump-equipped weed spraying outfits *now* and be sure of having the best at lowest cost for your customers. Mail the coupon below for a list of manufacturers using Oberdorfer Pumps.

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Please send me without charge or obligation, a list of weed spraying equipment manufacturers using Oberdorfer Bronze Spraying Pumps.

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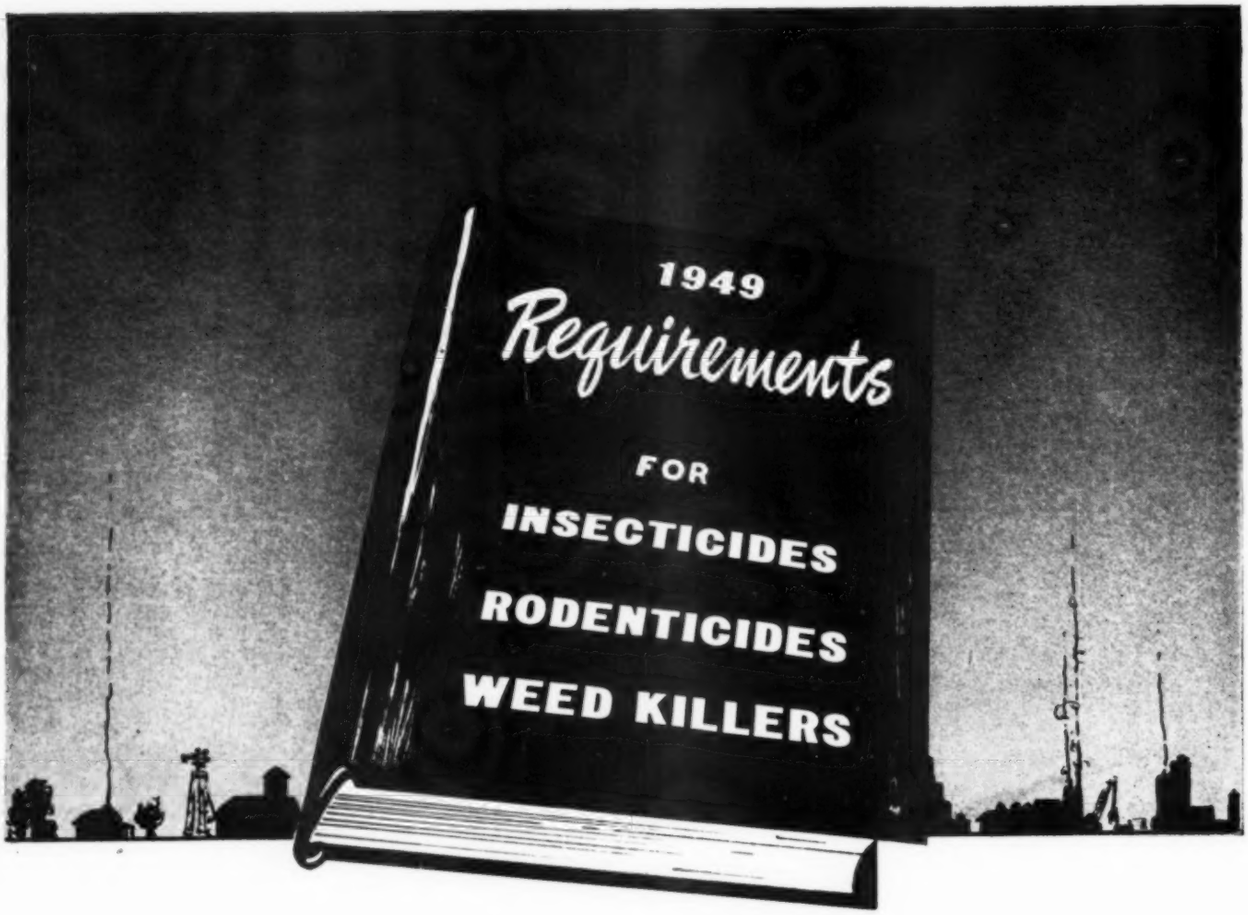

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THE EDITOR COMMENTS

AIRPLANE custom spray operators are in serious need of a system of licensing to weed out, for their own and the public's protection, persons entering the field with little knowledge of toxicants, of what damage they may cause, and under what conditions various materials may be used.

An insecticide manufacturer reported recently before a luncheon group, that a newcomer in the airplane pest control business had requested from him a quantity of lead arsenate dust to apply on a large tomato crop *for late blight!* That any such operation would violate all the rules of safey and common sense is obvious to every informed operator. Yet, had it not been for the guidance of a conscientious manufacturer, lead arsenate would have been applied to tomatoes shortly before their going to market. And, of all things, to stop late blight.

A recent wave of resentment toward the use of 2,4-D and certain insecticides, as voiced in state legislatures and through organs of public health and medical groups is causing worry among legitimate custom dusters, sprayers and foggers. They can see their 99 percent good record of sensible application being threatened by the widely publicized errors of an irresponsible one percent.

What can be done to eliminate this hazardous minority? Who are they? Is it possible to spot the ones who may spray 2,4-D on susceptible crops to kill insects? Does anyone who hires a job to be done know how much or how little the prospective operator knows about toxicants and their proper use? How can a farmer know an operator's abilities without first trying him out . . . with perhaps a year's crop at stake.

One answer to these problems might well be the formation of an association of airplane operators for the purpose of screening out incompetents. A strong national group, with active branches in the various states or regions could pass on the abilities of each operator applying for a license to control agricultural pests.

Education for those within the group should be emphasized, and an opportunity for learning the business should be provided for those who wish to enter. Possession of a membership card would then assure any potential customer that the operator knows more than merely how to zoom a plane over a cornfield.

There has been talk of such an organization for some time, but to our knowledge, no serious attempt on a national scale has been made to form an association. We think that this plan . . . or some other . . . must be adopted as soon as possible to aid in halting the wave of restrictive legislation which is already upon us, and which will become worse if irresponsible application is permitted to continue.

The manufacturing industry is helpless when it comes to careless application. Labels mean nothing if they are not read and heeded; yet, the manufacturer is too often criticized for the misdeeds of persons who misuse his products.

Someone must rise up and take the initiative. Who will it be?

PRIVATE industry can supply all the fertilizer which American farmers can use! This is the concensus of opinion of leaders in the fertilizer industry, confirming the facts in our recent editorial on current expansion of production and pointing out the manifest ability of private industry to supply all the needs of agriculture. The reaction to the editorial in the industry was positive and strong, practically all comments emphasizing the splendid wartime job and the continued production expansion and research since the war, the results of which must eventually accrue to the benefit of American agriculture.

One concise comment, typical of many received, came from James S. Coale, president of I. P. Thomas & Son Co. of Camden, N. J., manufacturers of fertilizers since 1868. Stated Mr. Coale: "The industry has clearly demonstrated that it is perfectly capable of furnishing

all the fertilizer which the farmers of the United States can use . . . If there should be some recession in farm production, there will be a heavy surplus of fertilizer. There is certainly no excuse for government production in competition with private industries."

This comment hits the nail squarely on the head, and at the same time raises the spectre of a fertilizer surplus in the event of reduced domestic demand, a subject to which every manufacturer has given much quiet thought attended by some worry. That manufacturers are willing to risk a surplus production later to supply current world needs bears mute evidence in support of the industry's serious intentions, and emphasizes more strongly than words that there is no need nor place for government competition in fertilizer manufacture.

INFORMATION within the agricultural chemical field is probably the most voluminous of any segment of science or the arts. It flows through almost countless periodicals, State experiment station and U. S. Department of Agriculture bulletins, pamphlets, brochures, mimeographed letters and books; and through a complicated array of meetings held in various sections of the country.

One who is "on the list" for the major portion of these periodicals, or who attends or receives detailed reports of scientific meetings covering the agricultural chemical field, can't help but be impressed with the sheer volume of research and experimentation going on continuously in both industry and governmental agencies, State and Federal. Nor can he escape the conviction that this material presents a composite picture of current developments in the field of new insecticides, weed killers, fertilizers and fungicides.

And the meetings! One who attempts to keep track of all of them in this specific field, not to mention those on the borderline which touch on agricultural chemical subjects, has a real job on his hands. For instance, every state has its own horticultural group which holds regular meetings, not to mention gatherings of smaller groups within the larger one. There is the American Association of Economic Entomologists and its annual convention, and several major branches of the parent association; the American Phytopathological Association; the two important national fertilizer groups; numerous conferences on insect control in cotton, corn, fruit, etc. held at various times of the year and in widely separated sections—not to mention the AIFA and local pest control organizations, etc., etc.

Looming large on the horizon with ever-increasing importance are the several weed control conferences, attracting the attention of agriculturalists the world over. The information coming from these conferences is enlightening and of growing interest of many who heretofore have been only mildly concerned with this phase of agricultural chemical development.

After surveying this mass of informative material day after day, the great extent of research progress in the use of chemicals in agriculture becomes more apparent than ever, as does the ever-widening scope of potential application. That much work yet remains to assimilate this wealth of research material and interpret the results for industry and agriculture is likewise apparent.

Only then will industry know where it stands and what it should produce; and agricultural leaders will know what to recommend for maximum benefits in practical usage.

NUMEROUS interesting questions are bothering the minds of entomologists, insecticide manufacturers and state and government officials regarding the reported tendency of flies to build up resistance to DDT through succeeding generations. If a degree of immunity is developed in insects against DDT, will similar experiences come with other chemical insecticides later? Will increased dosages correct the situation? Is a rotation of insecticides likely to become necessary?

These and other queries are bothering many persons in the field. No one as yet knows the answers, but their development will be watched with great interest as time goes on. Such complications added to the other ones connected with the manufacture and use of organic toxicants, certainly keep the entomologist's life from getting dull!

The South's Battle Against INSECTS & WEEDS

by

Eugene Butler*
Editor, Texas edition of
"Progressive Farmer", Dallas

Cotton belt farmers give every seventh bale to insects . . . some years every 4th bale. Chemical control of insects and weeds reduces per acre production cost

AMERICAN agricultural progress has been made in no small measure by the people who manufacture and distribute the insecticides, fungicides, application machinery, fertilizers, and other materials that go into the production of crops and livestock. The makers of these materials are constantly improving their products to make the farmer's job easier and more effective. Certainly, in no agricultural field has more progress been made than in the development of more effective insecticides. Southern farmers need and appreciate the service being rendered by the AIF Association and the companies which comprise its membership.

In manufacturing and distributing effective products to control insects pests of crops and livestock, fungus diseases, weeds etc., the industry is making a vital contribution to better farming and a more profitable agriculture in the South. This area is particularly vulnerable to pests of both crops and livestock. A long growing season with open weather most of the year, allows insects and disease to work much longer each season.

Cotton no longer dominates southern agriculture as it did 20 years ago. In 1925, 57 percent of the southern farmer's income came from cotton. By 1946, cotton's share was only 20 percent, but cotton is still the greatest commercial crop of the south, on which it continues to lean heavily. It is a crop that is in need of protection at this particular time. American cotton faces keen competition from synthetic fibers and the importation of foreign cotton. The next few years will tell the story. If the U.S. is to compete successfully, acre yields must be increased, and costs must be reduced. The pesticide industry can help by reducing insect damage; and cutting down acre costs by the control of weeds with chemicals.

The year 1947 was one of the best cotton years Texas has had in more than a quarter of a century. One must go back to the record crop of 1937 to find a higher acre yield than the 195 pounds of lint harvested last year. Yet the year 1946 was one of the poorest in many years. What made the difference? Insect damage. The crop of 1947 suffered little insect damage. Both weather and farmers joined hands to make it a bad year for cotton pests. On the other hand, insect damage was excessive in 1946. On an average, Texas cotton farmers are giving every 7th bale to insects. In the Cotton Belt as a whole, insects take every eighth bale. Some years, like 1946, in Texas they take every 4th bale.

One should consider what cotton insects have been doing to the growers pocketbooks in recent years. If insects have been taking every seventh bale, then for the 10 year period of 1937-47, they caused an annual average loss to Texas of 464,765 bales valued at $35,000,000. They also destroyed 210,000 tons of seed valued at nearly $9,000,000. This makes a total annual loss of more than $44,000,000. For the 16 years 1930-1946, USDA estimates the boll weevil destroyed $116,435,000 worth of cotton annually in 13 Southern states. Damage in 1946 by this pest was $319,000,000—other cotton insects destroyed $51,415,000, making the total insect toll $370,415,000.

The strange thing about this situation is that many farmers let insects rob them without doing much about it. If it rains too much or too little, a farmer is terribly worried about his cotton crop. But too often good farmers who are otherwise doing everything that needs to be done to produce good yields, accept insect damage as a matter of course. Yet when all the injury by insects is

* Talk given at 15th annual AIF Association meeting, Spring Lake, N. J., September 9, 1948.

added up, for Texas at least, it totals as much damage to cotton as dry weather and wet weather combined.

With present high cotton prices, it may be possible for the grower to go on taking these huge insect losses and still make a profit. But in the years ahead cotton insect control is quite certain to be an economic necessity. Insects must be controlled if farmers are to grow the crop at a profit. And we must also control them if cotton is to be grown at a cost low enough to compete with synthetic fibers.

The record in cotton insect control has not been good. But after 50 years of heavy insect damage, the cotton farmer is waking up. There is now more interest today in fighting insects than ever before in the history of the crop.

There are good reasons why many cotton farmers have failed to give sufficient attention to insect control. In the past it has not been as certain and safe a practice as many other cotton farming practices. Many cotton farmers can not dust their fields with the certainty of increased yields as they can in the use of good seed or commercial fertilizers.

For certain cotton insects, more effective insecticides have been needed, and now the comparatively new materials, chlorinated camphene, DDT and benzene hexachloride, and mixtures of the last two, are doing a fine job. The new insecticides have given cotton growers new hope. After 1946, Texas cotton farmers who used poison were discouraged. They had used lots of calcium arsenate, yet the boll-worm had ruined their crops. But conditions were different in 1947. Where farmers used the new insecticides, they could easily see they were much better than materials formerly used. In fact, the new insecticides have made many farmers thoroughly dissatisfied with older methods.

Farmers are now much encouraged to continue the fight against cotton pests. And they are buying more insecticides, as the figures on use of insecticides on cotton in Texas in 1947 and 1946 indicate.

The trend is very definitely away from calcium arsenate to chlorinated camphene, DDT, benzene hexachloride, and mixtures of DDT and BHC. In 1946, calcium arsenate made up 57% of the total volume of insecticides used on cotton in Texas. In 1947, it had dropped to 17 per cent. Meanwhile, the DDT sulfur materials had climbed to 31 per cent of the total.

The old standby, calcium arsenate, has not always proved effective against certain cotton pests. But there is a more important reason why so many farmers have failed to making dusting a standard cultural practice. It has been difficult for many farmers to learn how and when to apply insecticides to get the best results. Two things have been and are still necessary to make pest control pay:

1. **The farmer must be able to recognize the insects and their damage. He must be able to make infestation counts so he will know when to poison.**
2. **In applying poisons, he must follow through to the end on his dusting program regardless of what happens.**

Many farmers have not realized that a half effort at cotton insect control is often worse than no effort at all. They may start out to protect their crops from insect damage. Several applications of insecticides are made. Rain washes off the poison a few times; they get discouraged and quit. But even though insect control is not easy, there is good evidence that farmers can make it pay well—if they will buckle down and study the job.

Texas farmers have gotten good results in controlling boll weevil and cotton flea hoppers. Even before the new poisons came on the market, we had a case where a farmer made a dusting profit in 1946 of nearly $100 an acre. But that same year another farmer lost $17.15 an acre where he dusted. His applications were too few and too light. A crop of cotton was set during the first part of the season, but the field later became heavily infested with bollworms. The farmer was never able to control them. The yield on the dusted plot was 490 pounds of seed cotton per acre compared with 590 pounds where dust was not applied.

Always fairly reliable against the boll weevil, calcium arsenate has never been able to handle the bollworm satisfactorily unless farmers were able to apply it at exactly the right time. The new toxicants promise to do a much better job in controlling this pest.

An outstanding example of the effectiveness of the new cotton insecticides in controlling the bollworm was reported last year on an extensive plantation near Bryan, Texas. The owner had never been able to control this insect satisfactorily with calcium arsenate. At the end of the harvest, the following yields of seed cotton were obtained:

Chlorinated camphene — 2006 lbs.
DDT-BHC Mixture — 1666 lbs.
Calcium arsenate — 987 lbs.

Although there are many success stories in the fight against cotton pests, there are many problems to be solved. This is especially true of the bollworm. There are too many instances of heavy insect damage even where farmers apply insecticides under the direction of well trained entomologists. Again this year in parts of Texas, farmers failed to control this insect. Some entomologists doubt that the majority of cotton

TABLE I

Use of Insecticides on Cotton, 1947 and 1946

	1947	1946
Calcium arsenate	5,552,737 lbs.	11,144,020 lbs.
Calcium arsenate sulphur mix	3,965,679 "	513,685 "
Paris Green	64,014 "	104,807 "
DDT-Sulphur (5% & 10%)	9,039,497 "	4,120.611 "
DDT-BHC Mixtures	633,745 "	
Chlorinated camphene	141,465 "	
Dusting sulphur	11,565,135 "	3,191,365 "
Lead arsenate		348,854 "
Cryolite		125,171 "
Nicotine products		47,808 "
BHC		1,550 "
TOTAL	31,850,000 lbs.	19,596,000 lbs.

growers will ever be able to control it since adverse weather conditions may cause failure regardless of the effectiveness of the insecticide. There is need for a tremendous amount of work along the lines of improved methods of application, particularly with reference to the possible use of sprays for bollworm control.

Numerous failures to control the bollworm raise the question whether the right methods are being used. Entomologists in Texas are recommending that dusting for the boll weevil be delayed until at least 25 percent of the squares are punctured. But with the many failures with the bollworm, some farmers as well as entomologists are convinced that *pre*-square control should be widely practiced. This would kill out the earliest insects, preventing in every possible way early damage from flea-hopper, boll weevil, thrips and other early season insects in order to get the crop made before bollworms make their appearance.

Planning Necessary

AN effective program to kill insects requires organization and planning. One Texas plan has received widespread favorable notice. It is headed by the Insect Control Section of our State-Wide Cotton Committee of Texas, but brings into the program all the agencies in the state that are in position to make a contribution to its success.

What are our plans for controlling cotton insects in Texas? Briefly stated, they include the following:

1. Joint recommendations for the control of cotton insects, embracing both cultural methods and insecticides.
2. Training farmers to make the most effective use of the recommendations.
3. Survey to determine the location and extent of insect damage.
4. Organization in the county and community to put the recommendations into effect.

Each year a guide for controlling cotton insects in the state is published and given widespread distribution. Perhaps the most remarkable thing about this guide is that it represents the best thinking on the subject of all groups and agencies working for cotton insect control in the state. It is based both on research and practical field tests. Prepared by research and extension entomologists with the help of other interested groups, it is thoroughly up-to-date. As rapidly as information about the newer and more effective insecticides is developed, it is included in the guide.

An organized effort is made to put a copy of the guide in the hands of every person who is in position to help control cotton insects. It is printed by the Texas Extension Service and is distributed free of charge by county agents. Through their organizations, the guide is also being made available to insecticide and equipment dealers, and other groups including Veteran Vo-Ag instructors and trainees. Not only is distribution of the guide being made by state agencies, but plans are also being developed by county committees to insure that it is well distributed in every important cotton county.

The Texas Plan for Cotton Insect Control calls for a widespread program to train farmers to use the recommendations successfully. In this program, the farmer is to be taught to identify the insects that work in his cotton fields. He will study their life histories in order to know how to apply control measures most effectively. He will learn to make simple infestation counts at regular weekly intervals during the fruiting period.

The plan is to train the representatives of our educational agencies so that they, in turn, will be qualified to teach farmers how to fight insects successfully. The county agent is a key man in the county training program. Teachers of vocational agriculture and Vo-Ag veterans are in position to carry the training program to the community level. They might well help to organize training groups in their communities, calling on vocational teachers, veteran Vo-Ag teachers, or county agents to furnish the needed instruction.

As rapidly as farmers can be trained to make insect infestation counts, they should be organized to report these counts for the benefit of other interested groups. The reporting system could be built up gradually. Starting out on a community basis, which would keep other farmers better informed and help them make intelligent use of control measures, the survey might well be developed to cover the entire county. If the County Insect Control Committee could arrange for perhaps 10 per cent of the cotton farmers of the county to make regular infestation reports, this would provide a very effective service. Such information widely disseminated by newspaper and radio would prove invaluable. Ultimately such a program could be carried to the entire state.

A well rounded cotton insect control program calls for the full cooperation of the manufacturers, distributors and dealers in insecticides and dusting equipment. Cotton farmers need modern equipment for both cultural control and the application of insecticides. One weakness of the Texas program has been that insecticides are often not available when the need is most critical. The farmer who is doing the best job in fighting cotton insects keeps a reasonable supply of insecticides on the farm, ready for use without costly delay.

The insect infestation survey now operated cooperatively by the U.S. Department of Agriculture and state experiment stations has been of particular assistance in routing insecticides and equipment to areas of greatest need. To make the program still more effective, the County Insect Control Committee should make a careful study of the insecticide and equipment problems within the county.

Weeds a Problem

ALONG with its insect problems, Texas and other states have a tremendous weed situation. Southern farmers are becoming more and more interested in the chemical control of weeds and brush. Last year 40,000 acres of Texas rice were

treated with 2,4-D with an increase in yield of 3 to 4 barrels per acre. The amount of 2,4-D used this year as compared with last is greater, and it is being used over a wider area. All that has been applied this year by plane has been used as a spray. Some of the ground equipment applied 2,4-D in dust form, but in general the ground machines used sprays. Large quantities of 2,4-D have been used recently for the control of sage brush in the northern and northwestern part of Texas. Apparently good results are being obtained. The material is being used on mesquite and live oak and other undesirable range plants, but so far, it appears that sprout buds were killed in less than 5 per cent of the trials.

People in Louisiana are intensely interested in the pre-emergence use of 2,4-D and other chemicals in controlling weeds in cane. Forty-five days after spraying, some fields were still free of grass and weeds. Pre-emergence spraying seems to kill Johnson grass, one of the worst weeds. But the control isn't lasting because some of the seed buried as deep as 4" came up. One application of 2,4-D in the cane field is said to save at least three cultivations.

Unfortunately cotton is easily injured by 2,4-D. But it is hoped that within a short time, the industry may produce a chemical which is safe to use on cotton and as effective in controlling weedy grasses such as Johnson and Bermuda, as 2,4-D is on broad leafed plants. There is a dire need for a chemical that will kill the weeds in the cotton drill. The mechanization of cotton has been applied successfully to nearly all growing and harvesting phases. If there is a missing link, it is in killing the weeds in the drill. In a test at the Delta Experiment Station at Stoneville, Miss., it was possible to use tractor power and machinery for every operation except chopping. This is a hand tion to thin the plants and to kill the weeds in the drill which is performed with hoes. Of the 38 hours and 8 minutes of man labor required to produce an acre of cotton, 32 hours and 40 minutes went into chopping.

Some way must be found to kill the grass in the drill without the use of hand labor if cotton is to be produced at low enough cost to compete with other fibers. So long as a farmer could hire a hoe hand for 75 cents a day, cotton could pay its way in spite of Johnson grass and other weeds. But no such crop can stand as much hand labor as cotton has to have and pay it $3.00 or more a day. Chemical control of weeds may be the answer.

Cultural methods of weed control now being tried include improved planting methods such as check rowing, hill dropping and cross plowing—which make it easier to kill all the weeds. Flame cultivation has not had as wide acceptance as many people expected. From the time the cotton comes up until the stalk is the size of a lead pencil, the cotton plant can not stand flaming. Wet weather at this time brings the grass along speedily, and it may get too large for satisfactory flame cultivation. It is at this point that chemical control of weeds is especially needed.

Mississippi is doing considerable work on chemical weed control. In pre-emergence control with chemicals, some cotton is as good as that cultivated in the usual way. In some other tests, there was practically no control from pre-emergence application. Post-emergence control is also being tried with various oils and chemicals. Machinery for satisfactory application has been developed, but, so far, no suitable chemical has been found.

One of the sprays being used as a post-emergence treatment on cotton is an aromatic oil, which was used effectively for weed control in California vegetable fields. At the Delta Station at Stoneville, Miss., this oil has controlled weeds without injury to young cotton. After the cotton gets big enough to flame, the corky back apparently absorbs the oil which severely injures the plant. It seems that a treatment combining the use of aromatic oil until the cotton is big enough to flame, and then flame cultivation from then on, may be a solution.

In some work with corn in Kentucky, the cost of three cultivations with tractor and equipment was practically the same as that of pre-emergence treatment with 2,4-D plus a later supplementary spray treatment at a later single cultivation. It now appears that except in emergencies such as occurred in the wet season of 1947, weed control with 2,4-D in corn will not be a great deal cheaper than the usual three cultivations.

Pre-emergence treatment with 2,4-D seems to require about five times as much chemical as post-emergence treatments. However, they control crab grass, Johnson grass and "grass" weeds for five or six weeks after the crop comes up. This gives the crop a chance to grow up rapidly, and the weeds require but little cultivation or late spraying. A combination of spraying and cultivation may be desirable where weeds are difficult to control by cultivation alone.

Hazards of using 2,4-D however, include possible damage to cotton. Last year in Wharton and Matagorda Counties, Texas, it is estimated that about $300,000 damage was done to cotton by 2,4-D applied in dust form to rice by plane. The dust had drifted for some distance before reaching the cotton. Recent reports state that cotton damage up to $125,000 has been caused by the use of 2,4-D on rice farms in Brazoria County this year. Available information is that cotton is being damaged even though all the 2,4-D applied by plane this year has been in spray form. The amount of damage done to cotton in Texas is said to be as widespread as it was last year, although it is probably not as serious at any one place.

It seems rather certain that next January when the State Legislature convenes, strong efforts may be made to outlaw the use of 2,4-D in any form in Texas. Already the State of Louisiana has enacted legislation that prohibits the use of 2,4-D or any herbicide injurious to plant life except upon written permit by the the Commissioner of Agriculture. The Commissioner's regulations do not permit the use of 2,4-D in dust form in any situation.

The attempt to formulate rules

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By Neil W. Stuart [1]

TO introduce this subject, it is necessary to look into the history of soilless culture for a background. Probably the earliest account of growing plants without soil goes back to 1699 and refers to work by Woodward, an Englishman (10). The early history and gradual development of information about plant nutrition was reviewed by Shive in 1940 (7). It is only during the last two decades that attempts have been made to employ soilless culture methods for crop production. Recently Davidson has described large-scale soilless culture for plant research (3). Since World War II, popular interest in this subject has become greatly broadened due in part to the publicity arising from the successful use of soilless culture by the United States Army Air Forces for the production of salad vegetables at isolated bases (6). The purpose of this paper is to describe current methods of growing plants without soil and to discuss certain experiments dealing with various soil substitutes.

At the present time three general methods of crop production with nutrient solutions, collectively termed "nutriculture," are in use. These are:

(1) sand culture;
(2) water culture, sometimes called hydroponics; and
(3) subirrigation culture, also called gravel or cinder culture.

In sand culture the soil in beds, benches, or pots is replaced with fine sand which is watered with a nutrient solution applied to the surface of the sand. The method is useful for experimental studies but it is not well suited for large-scale crop production, because it is wasteful of water and nutrients, since surpluses drain away when applied.

In water culture plants are grown with their roots suspended in a nutrient solution contained in shallow tanks. The plants are supported above the water by wire netting or hardware cloth which is covered with straw or similar material in order to exclude light from the solution and maintain a high humidity around the upper roots. The solution must be aerated in order to supply sufficient oxygen to the roots. This is done by circulating the solution with a pump that mixes air with it, or by bubbling air into the solution through perforated pipes. The need for aerating the solution and the difficulty of supporting the plants are disadvantages of the method which are difficult to overcome.

Subirrigation Culture

IN the subirrigation method of culture, watertight beds or benches are filled with gravel or other suitable inert material which is irrigated from the bottom of the bed. This may be accomplished by pumping the nutrient solution from the storage tank or cistern into the bench, the bottom of which slopes slightly from the sides to the middle and also lengthwise to the point where the solution enters and subsequently leaves the bench. Inverted half-round clay tiles or boards nailed together to form an inverted V, are placed end to end lengthwise along the middle of the bench and serve as a channel for the solution. When the solution has nearly filled the bench, the pump

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TABLE 1

Average fresh weight and average number of flowers per plant of chrysanthemum plants grown in subirrigated nutriculture beds with different amounts of phosphorus. Each figure is the average for 45 plants of 6 varieties.

Growth Medium	*Phosphorus in Nutrient Solution P.P.M.*	*Averages per Plant Fresh Wt. Grams*	*No. of Flowers*
Defluorinated phosphate rock	< 1.0	276	77
Pebble phosphate rock	< 1.0	361	93
Gravel	3.8	223	69
Gravel	7.7	211	58
Gravel	15.5	352	92
Gravel	31.0	436	116

is stopped and the solution drains back to the tank by gravity. This is known as the direct feed system and is useful in greenhouses, propagation units, or other small systems. For larger installations it is more economical to employ the gravity feed system. The beds or benches are in series of three or four sections, each on a higher elevation and slightly longer than the one following it. Two solution tanks are used in this system. The larger one is located at the lower end of the beds and is below ground. It is connected by means of a flume with a somewhat smaller tank above the level of the beds. The smaller tank should have a capacity approximating one-half the total volume of the first sections of all the series. This tank is filled from the larger or sump tank before an irrigation is made. The nutrient solution flows into the first bed sections of the several series by gravity and then successively through the other sections, finally emptying into the sump tank. By this means only the solution for irrigating the first sections of the series has to be pumped, gravity flow irrigating the rest of the sections. The subirrigation method overcomes some of the limitations of the sand culture and water culture systems. It is in use by the United States Army in their operation of soilless culture gardens for vegetable production. The largest of these installations is located in Japan and comprises 16 five-acre units with a total bed area of 1,670,000 square feet. One of these units is under glass.

TABLE 2

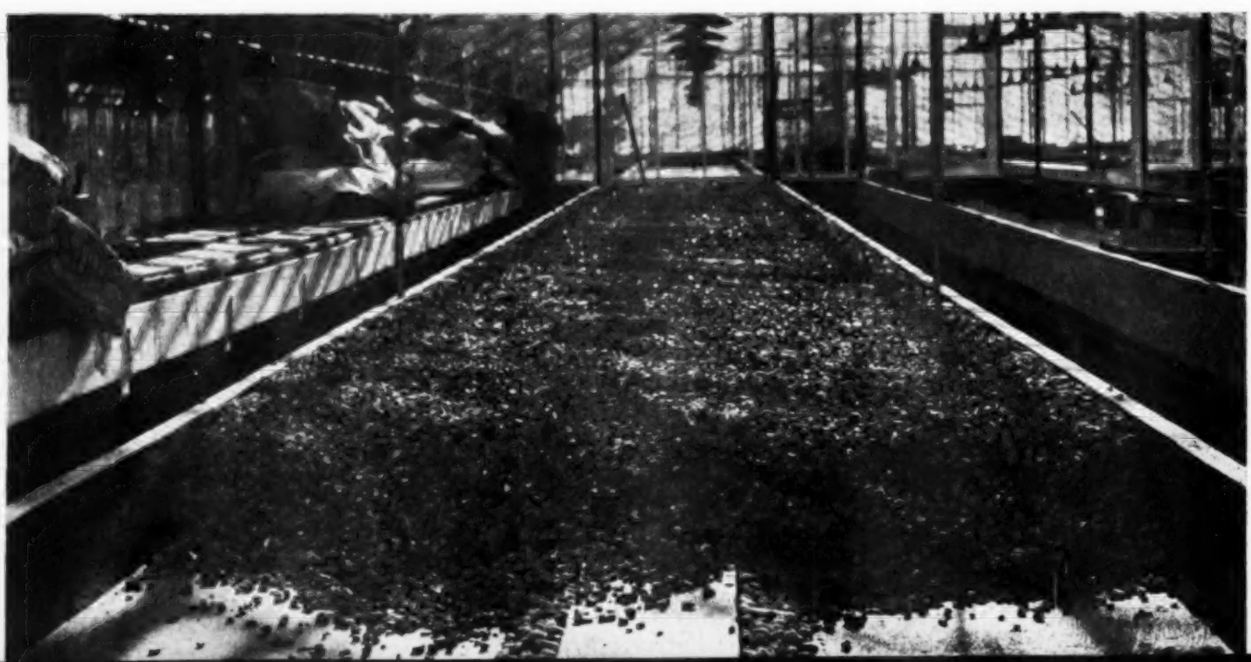
Properties of Urea-form materials supplied by the Division of Fertilizer and Agricultural Lime.

Sample	*U/F Mol ratio*	*Total nitrogen Percent*	*Solubility index P.P.M.*
G-4	1.15	37 06	42
G-2	1.20	37.68	73
G-3	1.27	38.50	105
G-5	1.31	38.50	131

Soilless Culture in U.S.

AT the Plant Industry Station, Beltsville, Md. soilless culture investigations have been in progress since 1941. The section working with floriculture and ornamental horticulture of the Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, maintains 20 concrete greenhouse benches comprising 5,400 square feet and divided into 88 sections, each section being provided with a solution tank and pump for subirrigation so as to give control of experimental treatments. These benches are used in growing plants for phytopathological, genetic, and physiological studies (1, 4, 5, 9). The latter includes studies in nutrient balance and absorption, effect of temperature, light, growing medium, etc. It is now generally recognized that rather wide limits of solution composition are capable of producing equally good growth with many plants. Less attention has been given in the past to the choice of the growing medium, other than soil, and its possible role in furnishing nutrients to the crop growing in it.

One of the soil substitutes now in use at Beltsville, expanded vermiculite, has proved superior to soil or sand for certain horticultural pur-



Concrete bench for subirrigation at the Plant Industry Station, U.S.D.A., Beltsville, Md. Depressed solution channel is covered with concrete slabs and coarse gravel. Bench contains expanded vermiculite.

TABLE 3

Nitrate nitrogen content of nutrient solutions at weekly intervals expressed as parts per million of nitrogen.

Date of Analysis		*Inorganic*	*Mol Ratio of Urea-form* 1.15	1.20	1.27	1.31
April	8	27.3	8.2	9.0	8.2	6.8
	15	25.8	8.6	10.3	9.7	7.7
	22	42.7	7.9	14.7	16.5	11.8
	29	27.8	5.3	13.1	17.0	20.5
May	6	37.2	4.1	10.9	18.6	23.1
	13	16.5	2.0	4.0	12.4	21.0
	20	22.8	1.0	3.8	13.3	21.8
	27	19.3	1.0	1.5	8.8	16.2
June	3	1.8	0.7	0.7	3.1	7.1
	10	15.8	0.3	0.2	0.4	2.0
	17	2.3	0.2	1.0	2.9	6.0
	24	15.9	0.2	0.3	0.5	1.9
July	1	1.5	0.2	0.2	0.5	0.8
	8	22.8	0.1	0.3	0.5	1.3
	15	5.3	0.3	0.4	0.6	2.0
	22	0.2	0.5	1.2	1.7	7.8
	29		3.0	9.2	19.8	27.1
Aug.	5		8.5	13.1	51.5	51 5
	12		12.0	33.9	65.8	61.5
	19		17.7	45.6	80.0	68.5
	26		21.2	54.5	87.6	75.8

poses. This product is obtained from naturally occurring deposits in Montana and other locations in this country. It is classified as a hydrated magnesium aluminum silicate and is used extensively as an industrial insulating material. The ore is laminated and made up of two minerals, vermiculite and biotite. In the former, the scales are bonded together with water molecules and in the latter with potassium. When the ore is heated to about 2000° F. the water is converted to steam and expands the ore to about 12 or 15 times its original volume. The resulting product is sterile, light in weight, highly absorbent, and retentive of water and air. These physical properties make vermiculite well adapted as a medium for subirrigation. In addition, the available calcium, potassium, and magnesium are sufficient for the growth of seedlings until they are of transplanting size. Vermiculite is also useful as a propagating medium in the cutting bench and as a growing medium in subirrigated nutriculture benches. A valuable property of the material is a water-holding capacity so high that nutrient solutions are pumped into the benches only once or twice per week.

Sintered shale, known as "Haydite," a commercial product used in making low-density concrete, is another useful growing medium. It is porous, light in weight, and has a higher water-holding capacity than gravel. It, too, contains calcium and potassium both of which are available to plants growing in it. "Haydite" has the further advantage of being more durable than vermiculite.

Phosphate Experiments

SINCE phosphorous and iron in the nutrient solution tend to precipitate each other, the maintenance of a low level of the former is desirable in order to avoid iron deficiency. Such maintenance of a low but adequate level of phosphorous requires that

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TABLE 4

Average fresh weight and average number of flowers and buds per plant of marigolds and fresh weight of chrysanthemums and tomatoes grown in subirrigated nutriculture beds with Urea-form and inorganic nitrogen. Each figure is the average for 6 plants.

Nitrogen Carrier	*Marigolds* *Fresh Wt. Grams*	*Number of Flowers*	*Buds*	*Chrysanthemums* *Fresh Wt. Grams*	*Tomatoes* *Fresh Wt. Grams*
Urea-form 1.15	358	5	3	52	343
Urea-form 1.20	591	10	7	76	755
Urea-form 1.27	680	15	13	116	1967
Urea-form 1.31	894	34	15	121	2041
Inorganic	660	22	10	109	1876

Below: Photo of cucumbers being produced in soilless culture. At the left, subirrigated Haydite. At the right, water culture. (Photo courtesy of J. W. Davis Co., Terre Haute, Ind.)

Legislative Threats, New Marketing Policies Discussed at 15th Annual

AIFA MEETING

THE 15th annual meeting of the Agricultural Insecticide and Fungicide Association attracted the largest attendance in the Association's history. The three-day session, was held September 7, 8 and 9, at the Essex and Sussex hotel, Spring Lake, N. J. with a total registration of 310, according to Lea S. Hitchner, executive secretary and treasurer of the group.

Serious situations faced by the industry in the prospect of threatened new legislation and the need for revamping some of its former marketing and sales policies were highlighted on the program.

The opening day's meeting consisted of afternoon sessions of the Association's Technical Committee and the Membership and Information Committee. In the evening, the Board of Directors met as did the Legislative Committee, while the remainder of conventioneers attended the showing of three movies.

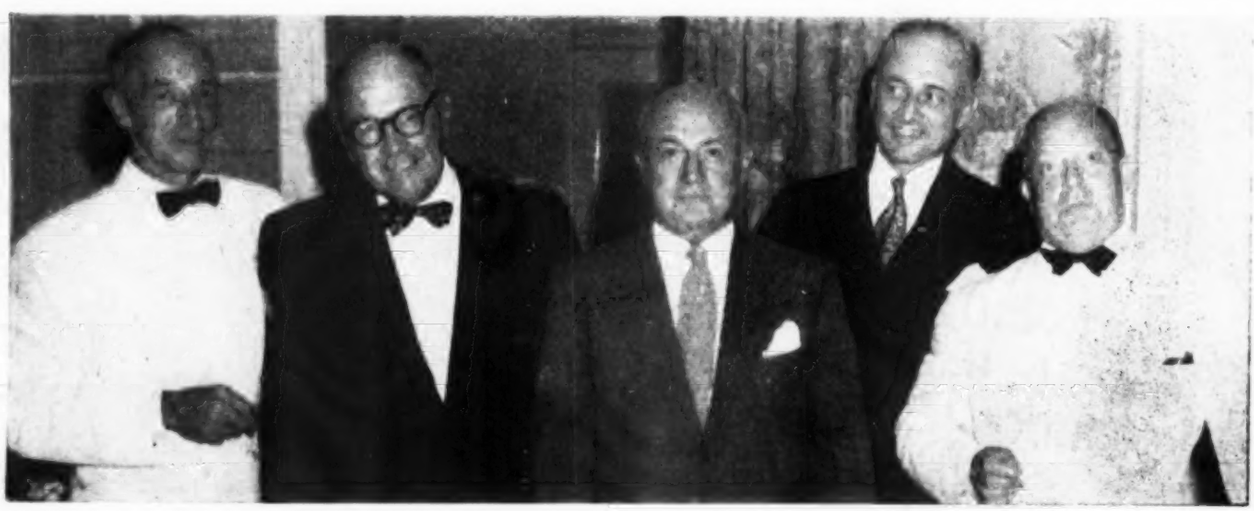
George F. Leonard, executive vice-president of Tobacco By-Products & Chemical Corp., Louisville, Ky., AIF president, opened the session on Wednesday morning, introducing Mr. Hitchner, who presented a resume of the Association's activities for the past year. He emphasized that the fundamental theory of the pesticide business must now embody not so much the mere production of chemical materials to kill insects, fungi, and weeds, but to make possible an improved end product in agriculture, safe to handle, and efficient in aiding plant growth.

Reports of a number of committee chairmen followed, preceding a paper by Dr. Stanley B. Freeborn, Assistant Dean, University of California College of Agriculture, Berkeley. Dr. Freeborn emphasized the need for basic research for "tailor made" insecticides, fungicides and herbicides, and discussed the tremendous problems facing the research staffs of the state Experiment stations. (Dr. Freeborn's entire address appeared in the September issue of *Agricultural Chemicals*). He illustrated the dangers which could arise from the indiscriminate use of chemicals by describing the experience of the California Station in finding out why cattle were being poisoned by molybdenum which had accumulated in forage plants eaten by the animals. He discussed the almost endless complications resulting from too little knowledge of reactions of chemicals used in agriculture. Many of these problems are caused by the varying conditions under which the products are used, he pointed out, a fact which presents serious problems to research staffs.

"A New Look at an Old Problem in Cotton" was discussed by

Former AIF Presidents

One of the few occasions when all of the former presidents of the AIF Association get together, was the 15th Annual Banquet. From left to right: George F. Leonard, incumbent; Ralph L. Chipman; Joseph L. Cary; J. L. Moyer; and L. S. Hitchner.

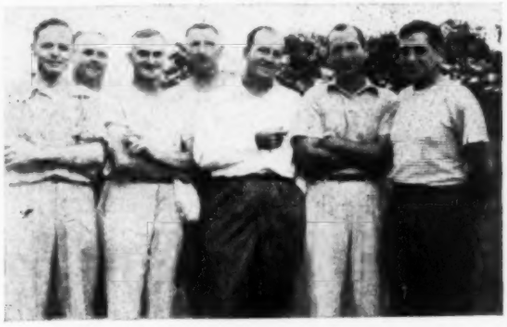


Claude L. Welch, Director of the Division of Cotton Production and Marketing of the National Cotton Council of America, Memphis, Tenn. He reviewed some of the losses incurred through insect infestations in cotton, and pointed out that last year's loss of over 1½ million bales of cotton and 613 thousand tons of cottonseed, represented a money loss of $283 million. From the consumer standpoint, this was equivalent to oil needed for 200 million pounds of margarine, 276,00 tons of high protein meal and 152,000 tons of hulls, which could have been translated into an additional 178 million pounds of beef or into 690 gallons of milk. He added, however, that the 1947 losses were about $63 million dollars less than those of the preceeding season, but that the damage was still of "tragic proportions."

Mr. Welch commended the recent efforts of industry, agriculture and the government to work out solutions of their mutual problems, and stressed the importance of proper application equipment in getting effective control. He lauded the work of USDA officials in making their recommendations on cotton insecticides several weeks in advance of similar announcements in previous years. "The speedup was especially fortunate for the 1948 crop," he said. "Such new poisons as benzene hexachloride and chlorinated camphene were officially recommended for the first time. Full reports were made on newer insecticides still in the experimental and testing stages," he went on, and added that these early recommendations also made possible earlier development of cotton insect control programs, and a more thorough educational job. The Cotton Council has supplemented this work by conducting special publicity and information campaigns through the press and radio in areas where danger from insect infestation is greatest.

He warned against complacency, however, stating that although both methods and materials have been improved, the fight is not over. He asked the continued cooperation of industry in conducting research and in assisting in the education of cotton

President Leonard addressing banquet group at Spring Lake. Others at table include Henry Wood, Lea Hitchner and Howard P. Mansfield.



Group of AIF golfers: (left to right) Don Gaarder, Sherwin-Williams Co.; Ed. Phillips, GLF Soil Building Service; Thomas Morgan, "Agricultural Chemicals"; Henry Wood, Tobacco By-Products Corp.; Don Ballman, Dow Chemical Co.; E. Meister, American Fruit Grower; and T. H. McCormack, Du-Pont.

A "Threesome" at the golf clubhouse: W. R. E. Andrews; J. L. Long, Tobacco By-Products Corp.; and I. W. Bales, Chipman Chemical Co.

General scene at AIF reception at Essex & Sussex preceding the annual banquet. Here started the songfest which continued far far into the night.

Many smiling faces appeared at the reception. Here are three: Mrs. John B. Harry, Dr. Carl Setterstrom, Carbide & Carbon Chemicals Corp., and Mrs. Setterstrom.

J. V. Vernon
Reports marked progress on the food conservation front

Paul S. Willis
Tells how industry fits into the food production picture

producers in the use of the new insecticides. He reminded industry that as the pest control program succeeds, the cotton farmer's income increases, and he becomes better able to utilize both the insecticides and application equipment to help him maintain his position.

J. V. Vernon, in his address, "Progress on the Food Conservation Front," stated that there is now a "fuller understanding and realization that pest control is a very important phase of any plan that is directed toward the production and conservation of our food and fibre crops. (His entire text appears elsewhere in this issue.)

Legislation Discussed

A LEGISLATIVE round-table brought out numerous points of information to the AIF members. Participating in the round-table were Dr. E. L. Griffin, Assistant Chief, Insecticide Division, Production and Marketing Administration, U.S.D.A.; Dr. A. B. Heagy, secretary-treasurer of the Association of Economic Poisons Control Officials; and Dr. Charles L. Smith, Technical Advisor of the AIF Association.

Dr. Griffin reviewed the interpretation system for the Federal Insecticide, Fungicide and Rodenticide Act of 1947. These interpretations are to be distributed to the industry shortly, he said, to insure uniform treatment of all similar products.

In following the first speaker of the round-table, Dr. Heagy outlined the function and organization of the Association of Economic Poisons Control Officials which was formed last year. He also discussed the fee system, commenting on the unwillingness expressed by some members of the pesticide industry to supply, themselves, the funds necessary to pay the costs of regulation. He observed that it seems somewhat unfair to ask taxpayers to bear the burden for the benefit of relatively small segments of the national economy.

Dr. Smith, speaking from the standpoint of industry, pointed out that the pesticides business is largely interstate, which tends to place it in a different category from industries which feature distribution of products largely within their own states.

He expressed hope that state legislatures will keep the spirit of the Act of 1947 in their laws, since it is both workable and effective, and brings about desirable uniformity. The industry is concerned over the "ever-mounting burden which is being placed . . . through enactment of additional state laws and the ever increasing registration fees," he said.

MEETING

THE largest and best meeting in the history of AIFA! No counting or other records were needed to determine this. Meeting sessions were crowded and discussions lively. Lea Hitchner was as busy as a one-armed paper hanger with hives. Over 300 persons attended the banquet. The public address system really worked and did not play tricks on Prez. Grub Léonard as it did a year ago. Everything went off like clockwork,—even the weather was perfect,—and it was a swell meeting,—incidentally, the fifteenth annual for AIFA.

* * * * *

Prizes for the golf tournament, —and Henry Wood had his hands full with about 80 entries,—were bottles of whiskey and orders for new hats. It is amazing the number of people who chose hats!

* * * * *

Most improved golfer in the tournament this year over last,— Westvaco's Jack Thom,—pardon Food Machinery's Mr. Thom. Before the 18 holes were over, he had been dubbed Muscles Thom by his opponents. Also it is reported that at the behest of his lovely wife, Jack invested in a new white tuxedo coat for the banquet, which he wore with perfect decorum and a spot or two of gravy before the evening ended.

* * * * *

Remember the St. Bernard dogs who carried brandy to lost travelers in the Alps? Well, Don Ballman and Bill Allen of Dow are likewise in line for heroes' medals after having met a couple of golf foursomes on the ninth green with a tray of what could have been iced lemonade, but which we suspect was not, inasmuch as appearances are sometimes deceiving. Anyway, we know of at least eight AIF golfers who are out to have medals awarded to Bill and Don for their life-saving thoughtfulness!

* * * * *

Music hath its charms to calm wild beasts,—and also to keep people awake at or about 2 A.M. . . but the AIFA double quartet led by one Friar Thompson did even better. It brought two Essex-Sussex night watchmen. But in spite of the rudeness of the interruption, events proved that AIFA has enough good voices in its membership to make up a full-size glee club. We have in mind John Rodda, Al Pfeil, Paul Mayfield and a few others.

* * * * *

When the past-presidents were introduced at the banquet, Joe Cary, Food Machinery's after-dinner charmer, laid them in the aisles, as expected. His whimsical humor is always tops, but this time, he was better than ever. And Chipman's Warren Moyer, debonair, smiling,—in sharp contrast to his serious public pronouncements to the industry back in his WPB days.

* * * * *

Gin rummy was widely played by AIFA attendants,—and at times wildly played. Rumor has it that two visiting firemen of whom Len Gopp, Michigan Chemical's silent strong man, was one, and an unnamed stranger, took Hercules' Mayfield and Atlas' Jack Miller to the cleaners. As usual, prior to starting play, Senor Gopp announced that he knew very little about the game and had not played since 1926 or thereabouts. Later reports indicated that messrs. Miller and Mayfield were inclined to disbelieve him.

* * * * *

Why do all entomologists love to play poker? When Greek meets Greek, 'tis said, they open a restaurant. When one bug man meets another, they start a poker game,—any hour of the day or night.

* * * * *

Hot arguments arose between visitors from the west coast and eastern conventioneers, over the relative merits of

He pointed out that since the industry's products are subject to federal law, it seems reasonable that state control should be limited to products made and sold within the state.

Restrictive legislation was described as a "potential threat" by Dr. Smith. He used as an example of such laws, those which have a tendency to restrict or prevent the application or sale of certain products. "Such legislation does not solve the problem," he asserted. "What is needed is sound education of the users of these materials."

On the other hand, Dr. Smith stated, "We cannot minimize the problem. We are taking all possible steps to reduce possibility of damage to the public either through use or misuse of these materials. Enactment of unsuitable legislation or unnecessarily restrictive regulations can well discourage further research on the part of the manufacturer with resultant stoppage of further development in this field," he concluded.

The round-table discussion completed the morning's program, and the group adjourned for lunch. There were no general sessions scheduled for the afternoon, but the AIF traffic committee had its meeting. Golf, surf-bathing, and individual conferences took up the afternoon for most of the attendants. A reception for members and guests was held in the late afternoon, following which the group retired to the dining room for the 15th annual AIF banquet. This event was featured by the awarding of golf prizes by the golf chairman, Henry Wood, Tobacco By-Products & Chemical Corp., Louisville, Ky. The main feature, however, was the introduction of past presidents of the Association, each of whom spoke a few words. Those thus honored were: Lea S. Hitchner; Warren H. Moyer , vice-president, Chipman Chemical Co., Bound Brook, N. J.; Joseph B. Cary, executive vice-president, Food Machinery Corp., San Jose, Calif.; George F. Leonard, Incumbent; and Ralph N. Chipman. The latter, although never an AIF president was a charter member of the Association and was one of the original signers of the incorporation papers.

Final Day's Program

PRESIDENT Leonard, upon opening the final day's session, called upon a number of committee chairmen for reports before introducing Dr. S. A. Rohwer, assistant chief, Bureau of Entomology and Plant Quarantine, U.S. Department of Agriculture. Dr. Rohwer, speaking extemporaneously, pointed out the contrast between industry's supply picture of this year and that of the past several seasons. He said that the rather heavy carry-over of materials from 1947 was due partly to light infestations of insects during the '47 season, and also to the fact that more effective materials, plus better methods of application, have caused a "leveling off" of insect populations. He observed that better distribution of products is necessary so that the needed materials may be at the right place at the right time. Despite the abundant supply of insecticides, at least three local shortages were reported this year because of poor distribution, he said.

The pesticide field is entering

SIDELIGHTS

the Atlantic and the Pacific covering the following points, to wit: (1) temperature. (2) Height of waves. (3) Scenic beauty. (4) Bathing beauties.

Supporters of Pacific superiority included staunch backers such as A. W. Mohr, Richmond Calif.; Joe Cary, San Jose, Calif.; Eugene S. Heckathorn, of Heckathorn & Co., Ltd., Richmond, Calif.; and Dr. Stanley B. Freeborn, of Berkeley, Calif. While many easterners timidly touched their toes in the water to exclaim about the chilliness, the Californians termed the Atlantic "warm," stating that the Pacific is at least ten degrees cooler. Jack Brunton, a native Californian, but a Penn Salt Philadelphian now, remained strictly aloof.

Regarding the waves, the scoffing westerners termed the Atlantic's pounding surf "ripples," saying that when one is knocked down by a wave in the Pacific, he is seldom able to get up again.
(Ed. Note: another "California dew" story?)

* * * * *

Next year's AIF meeting will convene the *Wednesday* after Labor day . . . a new policy to allow the Essex & Sussex staff better chance to clear the regular hotel visitors following the final holiday weekend of the summer. Next spring's meeting will be at the West Chester Biltmore, Rye, N. Y. instead of at Washington, D. C., Lea Hitchner says.

* * * * *

Dr. L. W. Kephart, U.S.D.A. weed control expert and member of the advisory staff of Ag. Chemicals, related some of the experiences he had on his recent trip to Kenya, East Africa, and in Europe. His plane landed at Cairo, Egypt on the day the U. S. had recognized Israel, and were those Arabs mad! A mob armed with sticks and clubs met the plane and threatened physical violence to the Americans aboard. It wasn't safe for them to stay overnight at Cairo as originally planned, Dr. Kephart said, so they hurried on, leaving the furious Arabs shouting, waving clubs, and kicking up a lot of dust . . . . later, a bumpy ride over the Sahara at night, disjointed not only the passengers, but the plane's landing flaps and brakes. Consequently they landed at

(*Turn to Page 60*)

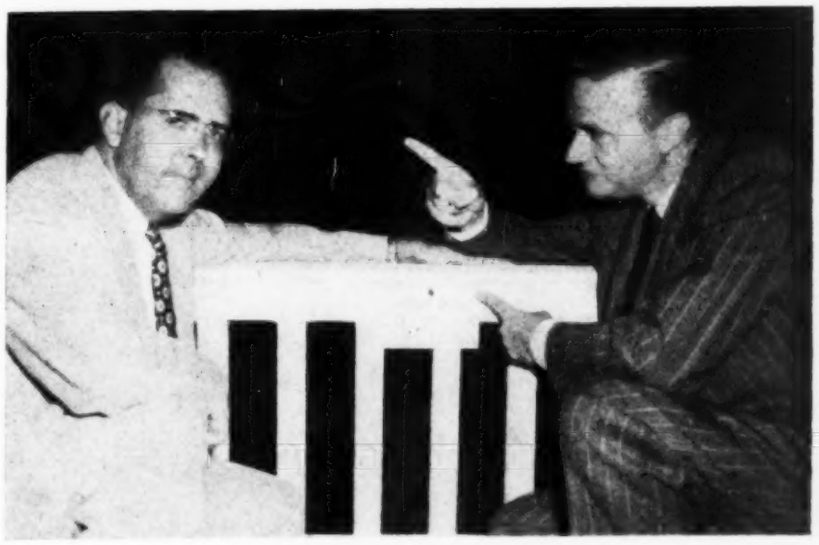


Photo →
Two principals in last year's balcony fall take seriously sign which says: "Please Do Not Sit or Lean on Railing." Bob Zipse, (R) admonishes Jack Brunton to heed the warning. Both stayed aloof from the hotel's wooden rails, at least.

a new phase of its history, according to Dr. Rohwer. The carry-over from last year is significant of a new and somewhat different approach to the entire industry. Insecticides are now being regarded as of the *insurance* type rather than of the economic appraisal type. He pointed out in illustration, that for control of codling moth in the Pacific Northwest, two or three DDT applications per season are now being used as compared to the ten or so of lead arsenate formerly used. In cotton, many growers are treating their crops even if no evidence of an insect infestation is in sight, as compared to the old technique of applying insecticides only after a 20 percent infestation had been noted. He warned against basing production schedules on old methods of estimating insecticidal needs. The industry will have to gear its planning to the new methods, he said.

Dr Rohwer discussed at some length the problem of brand names, stating that very few farmers know what to ask for in purchasing chlordane, BHC, chlorinated camphene, and DDT, whereas in the old days it was a simple matter to ask for lead arsenate, sulfur, etc. He said that the ultimate solution will be to coin trivial names for the products, but warned that even this will not help if these names are not used by the industry.

The growing tolerance to DDT being exhibited by some part of the fly population was mentioned by Dr. Rohwer as being of some significance. Laboratory experiments in recent months from some sources have begun to show that flies from areas where DDT has been used are much less susceptible to the insecticide than flies from places where DDT has not yet been introduced. He said that the whole question of DDT needs to be re-appraised, stating that while there is evidence that flies may build up immunity to the toxicant, part of the fault may be in faulty formulations of DDT, which if altered, might overcome the difficulty of insect resistance.

How the southwest is striving to control insects and weeds was described by Eugene Butler, editor of the Texas Edition of *Progressive Farmer*. (Mr. Butler's complete text appears in this issue).

A plea for close coordination between manufacturers of insecticides, the Food and Drug Administration, the U.S. Department of Agriculture, State Agricultural Experiment Stations, farmers and processors was made by Paul S. Willis, president of the Grocery Manufacturers of America, Inc., in his address Thursday morning. His talk, "What the Food Industry Expects from Chemical Manufacturers," reviewed the "old days" when insecticides of vegetable origin were largely used, and surface residues were readily removed by washing or peeling. He contrasted this situation with the newer organics which pose serious residue problems on many fruits and vegetables. The property of DDT of accumulating in fatty tissues and becoming a component of either body fat or milk fat was described by Mr. Willis, who also recalled that through the original uncontrolled use of DDT, many beneficial insects were reduced in numbers, such as honey bees which are of course active in fruit, pasture and crop pollination and in the normal biological control of harmful insects.

New problems are inherent with the use of BHC and other insecticides which introduce new complexities such as flavor alteration, residue penetration and toxicity, he said. Research is in progress to determine what is the cause of these undesirable reactions, however.

Mr. Willis expressed fear on the part of the food industry that some of the insecticides and fungicides recently released for agricultural use have not been adequately screened for toxicity to humans, animals or plants; nor have adequate methods of residue analysis been worked out for the protection of the ultimate consumer. For this reason, he said, some shipments of fruits and vegetables have been refused where certain of these chemicals were used.

The speaker lauded the AIF's effort to coordinate information for the entire industry, and to direct research into gaps not yet filled by existing information. "We are of the opinion that a joint effort by the AIF Association and the Associations serving the food industry will serve to keep us abreast" of helpful sources of information, he declared.

The extent to which a manufacturer is liable for his products was discussed by a forum composed of industry attorneys. A. W. Rinke, AIF Association counsel, originally scheduled to appear in the forum, was unable to attend because of illness. The importance of statements made in advertising and on labels was emphasized by the forum, which reiterated that statements thus made must be backed up by the performance of the product. If the product conforms to all claims made for it, the manufacturer should not be responsible, the forum stated, but great care must be taken in recommending proper application procedures. Airplane application should not be recommended on the label if there is a chance that

(*Turn to Page* 61)

New Board Members

The following were elected to the Board of Directors of the Agricultural Insecticide and Fungicide Association Sept. 9, at the 15th annual meeting, Spring Lake, N. J.:

D. S. Gaarder, Director of the Agricultural Chemicals Division, The Sherwin-Williams Co., Cleveland, Ohio.

T. H. McCormack, General Sales Manager, Grasselli Chemicals Dept., E. I. du Pont de Nemours and Co., Inc., Wilmington, Del.

Russell B. Stoddard, Coordinator of Insecticide Operations, U. S. Industrial Chemicals, Inc., New York City.

Those retiring from the Board were:

Howard P. Mansfield, Assistant to General Manager, Grasselli Chemicals Dept., The du Pont Company, Wilmington. Mr. Mansfield was one of the founders of A.I.F.A. in 1933, and has been a continuous member of the Board since that time.

George R. Rinke, Chairman of the Board of John Powell and Co., New York City. He has been a member of the A.I.F.A. board of directors since 1942.

H. DeWitt Whittlesey, Senior Vice-president, The Sherwin-Williams Co., Cleveland. Mr. Whittlesey has been a continuous member of the A.I.F.A. board since 1937.

Much of Success in Food Conservation Credited to the

CHEMICAL INDUSTRY

by

J. V. Vernon*

Vice-President, Niagara Chemical Division
Food Machinery Corporation

DURING the early part of 1948 when the Marshall plan was being set up, it was very evident that America would have an important part in supplying essential foods to the needy countries of the world. This brought upon us the necessity of making available all food products possible. It was at this time that the food conservation program was developed by the government, with recognition of the important part that pest control would play in developing a sound approach to the problem. Credit is due to the A.I.F. Association in starting off this program by a telegram sent to the president emphasizing the importance of pest control. Soon thereafter $1,000,000.00 was appropriated for the Food Conservation Program and a major part of this sum was directed toward development of better pest control. A great publicity campaign was then launched among farmers, gardeners, food processors, and many others to inform them of the benefits to be reaped by a sound and economical pest control program. In connection with this overall publicity campaign, the press and radio have devoted hundreds of thousands of dollars worth of space and time to education and promotion. Included were special coast to coast broadcasts on specific pest control problems, as they related to the overall food conservation program.

Some of the features emphasized included slogans such as "Save Farm-Stored Grain from Insects;" "Save Corn from the European Corn Borer;" "Save Food by Killing Garden Insects;" "Save Farm Grain by Fumigation;" "Save Grain by Controlling Livestock Pests;" "Save Crops by Controlling Grasshoppers;" 'Save Grain by Controlling Internal Parasites;" "Save Grain by Treating Seed;" "Weeding Small Grain and Corn with 2,4-D;" "Save Grain by Destroying Rats." (Dept. of Interior Publication).

Many of these programs had not previously been recognized officially by the U.S. Department of Agriculture, although they were part of the program of the Bureau of Entomology and Plant Quarantine.

The literature and general publicity were excellent. About 85% of the members of our industry cooperated actively, although some few companies did not take advantage of the opportunity offered. The cooperating companies tied in their advertising with the program, using not only paid space in farm papers but in other national magazines. Radio was also extensively used for portions of the program and the expenditures of the Government were exceeded by private industry. Publicity by the A.I.F.A., plus other cooperating agencies and members of this industry, amounted conservatively to more than $1,000,000. In addition, stickers were prepared by various members of

* Paper presented at 15th annual AIF Association meeting September 9, 1948.

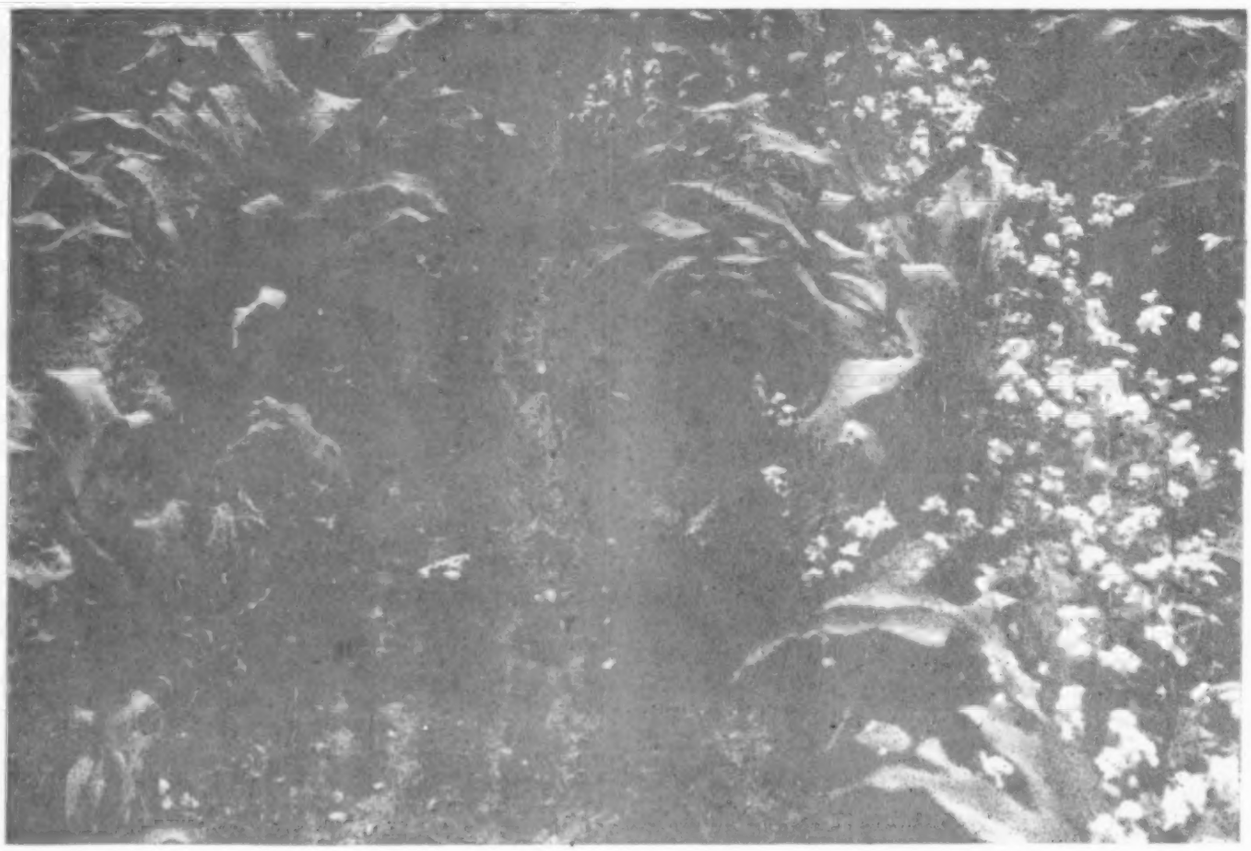
the Association for use on letterheads supporting the conservation program; many companies used spot radio announcements; salesmen of industry distributed both Government and specially-prepared literature of their own; special sales representatives were added, and many technical men were employed to promote products allied to the conservation program.

Numerous meetings sponsored by companies in the pesticide industry were conducted, with county agents and state officials prompting better pest control. Demonstration machinery and equipment was supplied by several companies in their educational and promotional work. A great amount of special literature on weed control, protection of crops in storage bins and in transit, etc., was prepared and distributed by both government and industry.

It is yet a little early to know the full results of all the public relations activity. However it can be said that people everywhere in this country are more conscious than ever before of the importance of pest control in connection with food consumed by ourselves, as well as worldwide food production and conservation. A fuller understanding and realization has been established that pest control is an important phase of the production and conservation of food and fiber crops. For the first time the Bureau of Agricultural Economics has made reference in one of its reports to chemical control as one of the reasons for record yields. I quote:

"On July 1, corn was growing rapidly in all sections of the country. The crop was not suffering from any dry weather anywhere except in small sections of the South Atlantic and South Central States. In most areas, the moisture supply was above average. The warm weather at the close of June made for rapid development. Hybrids are being grown on 75 percent of the total corn acreage this year, compared with 72 percent a year ago. Indications are that more fertilizer is being used this year. Farmers have been able to keep fields generally clean. More power cultivators were available and the use of chemicals for weed control apparently was considerably increased."

The pesticide industry geared itself to this task by organizing every phase of its operations to take care of the potential demand. Some of the newer phases of pest control are somewhat unknown to the industry because historical background on which to proceed is lacking. However, in instances where facts were known, as in the case of the cotton crop, which during 1947 suffered an estimated loss of cotton from insects of over $200 million, industry prepared to serve this need, and to provide toxicants for the prevention of such losses. Industry did do a remarkable job and to the writer's knowledge there never was during this past season an infestation area where there was not an adequate supply of insecticides close by. For example, the infestation of cotton insects was generally light and very spotted



An outstanding example of how chemical application helps to produce greater yields of foodstuffs in the U. S. The corn below (left) was sprayed with 2,4-D when it was approximately 18" tall. Note the presence of heavy weed growth in lower right hand corner where herbicide was not applied. (Photo courtesy U.S.D.A.)

during the past season, but nevertheless, this industry was ready with factories in a stand-by position, with ample stocks made up in their factories and on the ground for immediate use, to have taken care of the worst type of cotton insect infestation. It is estimated that the use of cotton insecticides during this past season was but from 60 to 75 percent of the amount used during 1947. Industry was ready to take care of fully 50 percent more of a demand than actually developed in 1947. Result—there is a substantial carry-over of cotton insecticides in the hands of industry. To those who have been identified with cotton insecticides for many years, this is not alarming, even though it is highly undesirable.

Another important problem of the food conservation program, and one that was more or less unknown, was control of the European corn-borer. The organization and cooperation by interested states, government, and industry, was magnificient. No details were overlooked in preparing for a successful campaign in the control of this pest. Fortunately for the corn industry, only sporadic outbreaks of serious nature were found during the past season. However, in those affected areas, all interested agencies worked together as a well-drilled team, and no time was lost in putting into effect the control measures which proved to be effective. It is estimated that in the heavily infested corn borer areas 25 to 40 additional bushels of corn per acre can be attributed to this control program.

Again industry was ready to serve the needs adequately with ample stocks of dusting and spraying materials. It should be remembered however, that due to the light infestation in relatively small areas of the corn belt, that substantial stocks of insecticides which were intended for use in corn borer control are carried over for next season. Fortunately, these stocks for the most part are still in the hands of industry. Industry thus met the challenge as its duty in the overall food production and conservation program.

Role of Herbicides

ONE of the greatest contributions of science to modern agriculture was the development of dichlorophenoxyacetic acid, commonly referred to as 2,4-D. The early introductory stages have seen much misuse of the material, resulting in restrictive legislation in some states. However, when applied in the correct manner, under proper conditions of time and place, this chemical is proving to be worth millions of dollars to American agriculture. Here again, the industry was faced with a use field with little historical background as a guide. We should honor the far-seeing members of this industry who prepared to supply at least a portion of the needs which suddenly became aparent. Excellent co-operation between government, interested states, and the pesticide industry, made possible an intelligent and carefully directed large scale use of 2,4-D in controlling weeds in small grains and corn fields during the past season. It is estimated that millions of acres of crop lands were treated with 2,4-D and other selective weed-killing compounds last season, without injury to the corn and grain plants. The acres so treated have shown increases in yield as high as 25%. Thus the pesticide industry has again come to the front with a substantial contribution, to make possible increased production of food crops.

Storage Protection Vital

WITH the tremendous grain crop being harvested this fall, it becomes increasingly important that the normal loss from storage grain insects, rats, etc., be kept at a minimum. The full cooperation of every agency is highly important, in order that the crop which has been produced may be adequately protected during the storage period.

It has been estimated that in the U.S. rats alone destroy two hundred millions of dollars worth of food products, annually. Through the cooperation of government, industry, cities, towns, and allied interests, rat control campaigns were conducted this past season. These campaigns were successful and although there are as yet no casualty figures available, it is reasonable to assume that millions of rats were destroyed, resulting in substantial saving of food products.

Parasite Control

DURING the past several years while there has been an acute shortage of meats and fats, the pesticide industry in cooperation with federal and state government, and allied interests, has developed products suited for the control of both internal and external parasites of livestock. This has made possible the production of millions of pounds of beef, milk and pork through the judicious use of these parasiticidal materials. Continuous development and more intelligent use will no doubt bring further advances along this line.

With the development of new chemicals for the control of agricultural insects and diseases have come also numerous complicating hazards of use. The well directed cooperation of industry, government, states and allied interests should be mentioned again. Their job is to work out specific recommendations for the use of these products in an organized manner. This will result in better and more economical pest control and will also protect the health and safety of the public.

The whole point is that industry was ready, is still in readiness, and will continue to be ready to do its part in making available the materials which are needed and seeing to it that these products are on hand in the right places and at the right time to do the job for which they are intended. It is well known within the industry, that this service was provided at a minimum of profit to the members of the industry, and therefore of maximum benefit to the growers of food products.

It appears to be increasingly important, therefore, that members of the pesticide industry cooperate fully and wholeheartedly so that the natural results of such cooperation may bring about a better way of living for all our people.★★

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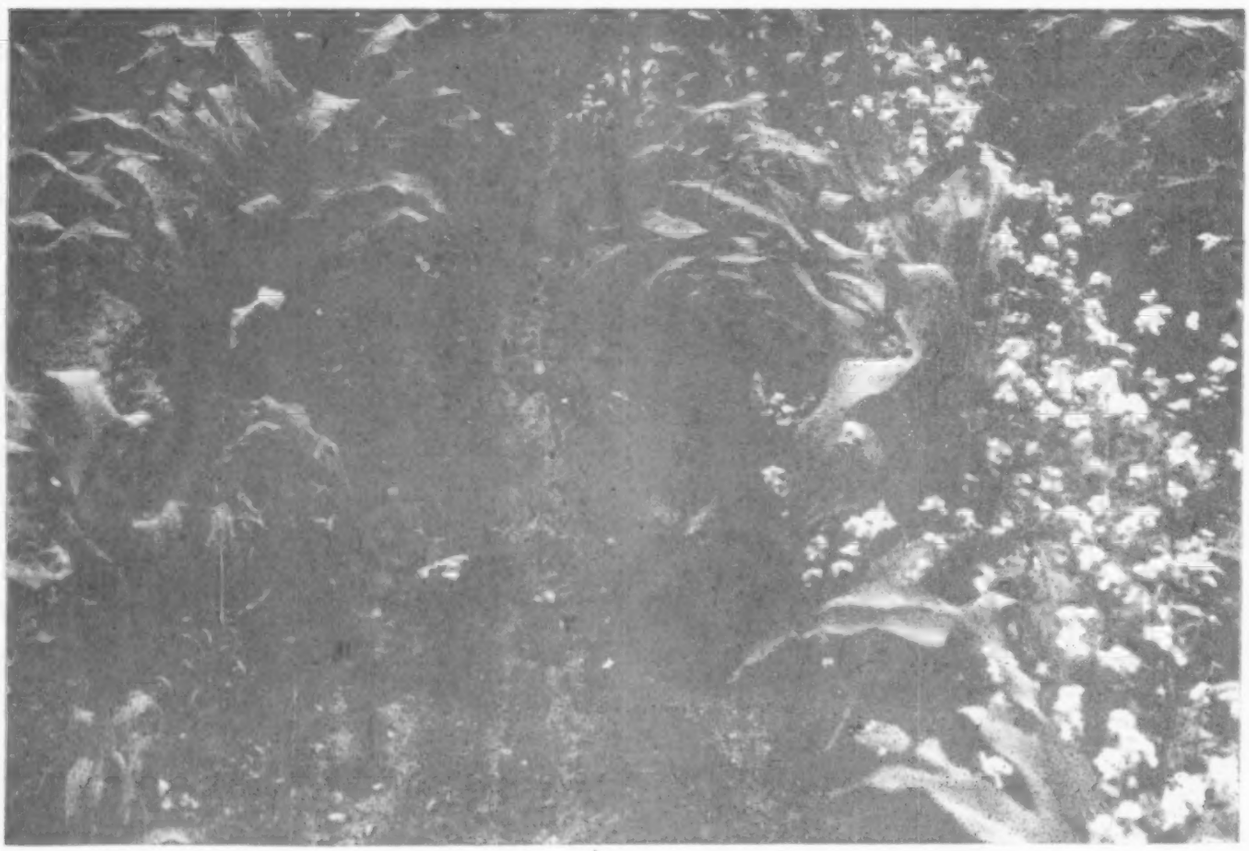
The pesticide industry geared itself to this task by organizing every phase of its operations to take care of the potential demand. Some of the newer phases of pest control are somewhat unknown to the industry because historical background on which to proceed is lacking. However, in instances where facts were known, as in the case of the cotton crop, which during 1947 suffered an estimated loss of cotton from insects of over $200 million, industry prepared to serve this need, and to provide toxicants for the prevention of such losses. Industry did do a remarkable job and to the writer's knowledge there never was during this past season an infestation area where there was not an adequate supply of insecticides close by. For example, the infestation of cotton insects was generally light and very spotted



An outstanding example of how chemical application helps to produce greater yields of foodstuffs in the U. S. The corn below (left) was sprayed with 2,4-D when it was approximately 18" tall. Note the presence of heavy weed growth in lower right hand corner where herbicide was not applied. (Photo courtesy U.S.D.A.)

during the past season, but nevertheless, this industry was ready with factories in a stand-by position, with ample stocks made up in their factories and on the ground for immediate use, to have taken care of the worst type of cotton insect infestation. It is estimated that the use of cotton insecticides during this past season was but from 60 to 75 percent of the amount used during 1947. Industry was ready to take care of fully 50 percent more of a demand than actually developed. in 1947. Result—there is a substantial carry-over of cotton insecticides in the hands of industry. To those who have been identified with cotton insecticides for many years, this is not alarming, even though it is highly undesirable.

Another important problem of the food conservation program, and one that was more or less unknown, was control of the European corn-borer. The organization and cooperation by interested states, government, and industry, was magnificient. No details were overlooked in preparing for a successful campaign in the control of this pest. Fortunately for the corn industry, only sporadic outbreaks of serious nature were found during the past season. However, in those affected areas, all interested agencies worked together as a well-drilled team, and no time was lost in putting into effect the control measures which proved to be effective. It is estimated that in the heavily infested corn borer areas 25 to 40 additional bushels of corn per acre can be attributed to this control program.

Again industry was ready to serve the needs adequately with ample stocks of dusting and spraying materials. It should be remembered however, that due to the light infestation in relatively small areas of the corn belt, that substantial stocks of insecticides which were intended for use in corn borer control are carried over for next season. Fortunately, these stocks for the most part are still in the hands of industry. Industry thus met the challenge as its duty in the overall food production and conservation program.

Role of Herbicides

ONE of the greatest contributions of science to modern agriculture was the development of dichlorophenoxyacetic acid, commonly referred to as 2,4-D. The early introductory stages have seen much misuse of the material, resulting in restrictive legislation in some states. However, when applied in the correct manner, under proper conditions of time and place, this chemical is proving to be worth millions of dollars to American agriculture. Here again, the industry was faced with a use field with little historical background as a guide. We should honor the far-seeing members of this industry who prepared to supply at least a portion of the needs which suddenly became aparent. Excellent co-operation between government, interested states, and the pesticide industry, made possible an intelligent and carefully directed large scale use of 2,4-D in controlling weeds in small grains and corn fields during the past season. It is estimated that millions of acres of crop lands were treated with 2,4-D and other selective weed-killing compounds last season, without injury to the corn and grain plants. The acres so treated have shown increases in yield as high as 25%. Thus the pesticide industry has again come to the front with a substantial contribution, to make possible increased production of food crops.

Storage Protection Vital

WITH the tremendous grain crop being harvested this fall, it becomes increasingly important that the normal loss from storage grain insects, rats, etc., be kept at a minimum. The full cooperation of every agency is highly important, in order that the crop which has been produced may be adequately protected during the storage period.

It has been estimated that in the U.S. rats alone destroy two hundred millions of dollars worth of food products, annually. Through the cooperation of government, industry, cities, towns, and allied interests, rat control campaigns were conducted this past season. These campaigns were successful and although there are as yet no casualty figures available, it is reasonable to assume that millions of rats were destroyed, resulting in substantial saving of food products.

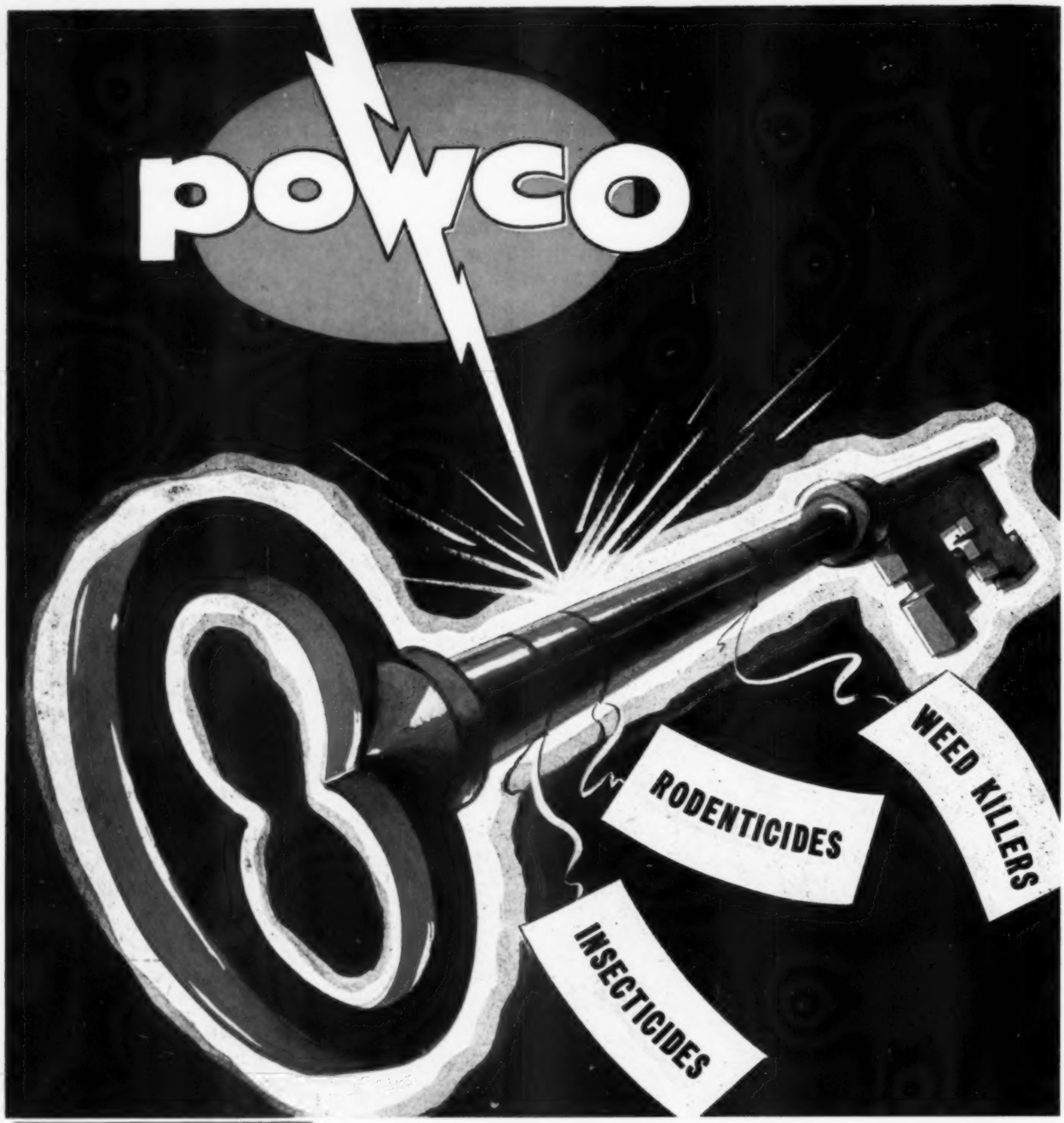
Parasite Control

DURING the past several years while there has been an acute shortage of meats and fats, the pesticide industry in cooperation with federal and state government, and allied interests, has developed products suited for the control of both internal and external parasites of livestock. This has made possible the production of millions of pounds of beef, milk and pork through the judicious use of these parasiticidal materials. Continuous development and more intelligent use will no doubt bring further advances along this line.

With the development of new chemicals for the control of agricultural insects and diseases have come also numerous complicating hazards of use. The well directed cooperation of industry, government, states and allied interests should be mentioned again. Their job is to work out specific recommendations for the use of these products in an organized manner. This will result in better and more economical pest control and will also protect the health and safety of the public.

The whole point is that industry was ready, is still in readiness, and will continue to be ready to do its part in making available the materials which are needed and seeing to it that these products are on hand in the right places and at the right time to do the job for which they are intended. It is well known within the industry, that this service was provided at a minimum of profit to the members of the industry, and therefore of maximum benefit to the growers of food products.

It appears to be increasingly important, therefore, that members of the pesticide industry cooperate fully and wholeheartedly so that the natural results of such cooperation may bring about a better way of living for all our people.★★



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Protecting Canada's Stored Grain by

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H. E. Gray
Chief, Stored Product
Insect Investigations
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PART II

Insects on Ocean Ships

IT was quite obvious to those concerned with the protection of food for overseas shipment that clean transportation was one of the first essentials if insect losses were to be kept to a minimum. Essentially insect-free grain could be delivered to the ships at the sea-board. There was no guarantee, however, that the cereals would not become contaminated en-route and thus present the people in Great Britain with an insect control problem upon arrival. This was a situation to be avoided at all costs. It was decided that all boats carrying grain and cereal materials overseas would be examined and treated if necessary before being loaded. This proved to be wise because as time went on, many of the newer, cleaner boats were sunk by submarines and older, less desirable vessels had to be used.

Shortly after the outbreak of war the writer visited all of the Maritime ports of Canada and instructed the inspectors of the Division of Plant Protection in the methods of boat examination. A short outline of the procedure is given below.

The inspectors, usually two in number, went aboard the boat, and after securing pertinent information regarding past cargoes from the first officer, made a complete examination of the hold space, particularly where cereal products would be carried. If the boat was clean, or had not carried cereal products previously, a certificate indicating that it was in suitable condition for the carrying of cereal products was issued.

If cereal debris and possibly slight traces of infestation were found in the boat, certain spots were indicated which should receive special attention when the boat was being cleaned. After the cleaning was done, the space was re-inspected.

At times, badly infested boats were encountered. In most cases the first inspection revealed that treatment of the boat was necessary. A suitable pest control operator then carried out the necessary measures. Following the treatment, the ship was re-inspected and if satisfactory, a loading certificate was issued.

Two types of treatment were used: (1) contact sprays, and (2) fumigation.

During war years it was most important to delay the loading of a boat as little as possible in order that it might maintain its convoy schedule. The use of contact sprays, while not as effective as fumigation, did enable loading to proceed within an hour after spraying the hold in question, and the crew could remain on board during the treatment. Further, no time was needed for aeration. Contact sprays of extract of pyrethrum in a high grade water-white oil gave satisfactory results.

Fumigation with HCN at a dosage of 8 oz. or more per 1,000 cu. ft. of space has been used in a number of cases. This control measure has been fairly general at Vancouver where even individual holds have been treated successfuly. This procedure has been used to a limited extent in the East, usually where both rat and insect control were necessary on the same boat.

Since the war, considerable attention has been devoted to the inspection of stowage sacks. These are usually carried by the boat from port to port and used as required to prevent the shifting of the cargo while on the high seas. As many of the boats carry cargoes from many lands, the sacks at times carry infested grain. The purpose of the inspection is to detect infestation and to carry out appropriate treament usually on board the boat. This treatment will prevent the transfer of insects from previous cargoes to clean Canadian grain.

The suppliers of stowage sacks in Canada are co-operating with the Divisions of Entomology and Plant Protection by supplying insect-free bags to the ships when further supplies are needed.

No account of the work of insect control in boats used to carry

* Contribution No. 2563, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

grain and cereal products to Great Britain would be complete without reference to Mr. Gowans, Thomson & Earle Ltd., Montreal, the Canadian representative of the British Ministry of Food. Mr. Gowans has at all times greatly assisted the work by advance information on arrival and loading of boats, and by insistence that the Departmental requirements be met by the shipping companies.

Out of the total of 2,791 boats used during war years, there was an adverse report from the British Ministry of Food on only one cargo. Since the conclusion of the war and the incoming flood of bulbs and nursery stock, it was not possible to examine every boat carrying grain and cereal products to Great Britain and a few instances of infestation have been reported. These reports were sufficiently disturbing that a program is now in effect whereby all boats carrying grain overseas will have their hold space and stowage sacks examined and treated if necessary.

General Infestation

MOST cases of insect or mite infestation occurred in grain stored in temporary storage facilities. It was soon recognized that grain in "dead" storage in such structures is much more susceptible to attack than in the normal storages such as country or terminal elevators. Because of the insulation provided by large storage units, the advantage of low winter temperatures is very largely lost. It is difficult to maintain the temporary structures in a weather-tight condition and the moisture reaching the grain frequently results in economic infestations. Moisture tends to accumulate at the large grain surface in the temporary storages and this greatly favors the development of grain mites.

Detection of localized insect infestation in both the country and terminal annexes was a primary difficulty. Methods for checking grain temperatures and securing grain samples by probing were generally used and proved valuable. A multiple sample probe was developed by the Grain Research Laboratory which greatly reduced the time and labor in probing. The presence of patches of "tough" grain on the surface during the winter was frequently associated with "hot spots" deep in the grain. Experience showed that these occurred most often in the central part of the storage, a circumstance which greatly reduced the area in which intensive probing was necessary and permitted their detection before they reached serious dimensions.

With the continuance of long time storage, there was a sequence of entomological problems. During 1940 and 1941, grain mites were the principal pests. In 1941 a few infestations of the rusty grain beetle, *Laemophloeus ferrugineus* Steph., were reported, while by 1942 this insect was the major pest encountered. Rice and granary weevils, *Sitophilus oryzae* L. and *S. granarius* L., were taken for the first time in commercially stored grain in central and southern Manitoba. Spider beetles, normally pests of stored flour, were found in a considerable number of cases infesting the surface of stored wheat.

Psocids, *Liposcelis divinatoria* Mull., formerly regarded as harmless in stored grain, were found to be capable of causing heating of stored grain in the large terminal annexes.

The direct damage to the grain in Canada was relatively small. The most abundant pests were types which confine their attack to the germ end of the kernel or feed in the debris associated with the grain. Indirect damage, on the other hand, due to the increase of temperature and moisture content of the grain infested with these pests, was considerable. In some cases, grades were lowered, and it was necessary to "turn" and move large quantities of grain because of insect infestation.

Considering the amount of grain in storage, however, the losses from all sources were quite small. This was due largely to the eternal vigilance of the grain trade. They realized that if infestations became established in the storages, valuable food would be lost and the owners would suffer financial loss. Inspection crews were maintained in the storages to carry out a continuous check on the condition of the grain. They were able to detect many of the infestations in the early stages and thus avoid serious losses. Because of the structural features of the annexes and distress storages, the movement of grain from these structures was both expensive and slow. To eliminate a "hot spot" of even limited size, it was necessary to remove a large amount of grain.

Preventive Measures

PREVENTIVE measures formed the back-bone of the insect control program in protecting the stored grain. Mention has already been made of the regular inspection of the grain to detect incipient infestations. The entire program was planned to reduce the possibility of insect damage. Many of the country and terminal annexes were emptied each year. Before refilling, control methods were applied to the empty building to eliminate any residual infestations. Slaked lime was dusted over the floors. Insecticidal sprays were used in some cases. The floors were all carefully inspected for cracks and all breaks were sealed with asphalt.

Grain cars that had carried infested grain were found to retain numbers of insects. Arrangements were made whereby all shipments of grain known to be infested were marked "infested" on the bill of lading. These cars were thoroughly cleaned at the terminal elevator following unloading. The infested grain was not stored in the terminal annexes but was cleaned and placed in elevator bins where turning or fumigation could be readily carried out. Where infestations of the rice and granary weevil were encountered, the grain was fumigated and placed under quarantine. This grain was then moved into consumption in such a way that the contamination of public premises or carriers was avoided.

Grain Mites

SEVERAL species of grain mites were concerned in the grain storage problems in Canada. The most important was the common grain mite, *Acarus siro* L., (*Tyroglyphus farinae* DeGeer). Of lesser importance were the hairy grain mite, *Glyciphagus*

cadaverum Schr., and *Glyciphagus domesticus* DeGeer, and *Caloglyphus* sp., all of which proved to be injurious. It has been shown that mites increase the moisture content of the grain and heavily infested material went out of condition. Degermination of the kernels was common and this in turn decreased the baking quality of the grain. The presence of the common grain mite was particularly objectionable because of the foreign odor it imparted to the grain. Associated with this species were several predatory ones, *Cheyletus eruditus* Latr., and several species of the family *Parasitidae*.

Mite infestations occurred for the most part in the annexes associated with country elevators and in farmers' granaries. The top of the bin was the most frequent location of infestation. Quite often the grain at this point carried excessive moisture and in some cases was "crusted" or "caked." However, infestation was also found at the bottom of the bin and at times, followed a cone of moist grain caused by a roof leak.

The moisture content of the grain is apparently the critical factor for grain mites, as heavy infestations were found only in grain with a moisture content of 14 per cent or more. The grain temperature is of lesser importance as mites can breed successfully at temperatures as low as 40°F. although the optimum is about 65°F.

Mite infestations were quite common in the country annexes in 1940-41. During the fall of 1940 these structures were filled almost to the peak of the roof with little provision for ventilation. The warm moist air rising into this dead air space was unable to escape and condensation occurred on the cold grain surface.

This condition was largely remedied during the following season. The grain level was dropped to the plate and ventilators were installed at the eaves and in the roof to promote a good flow of air over the surface of the grain, with the result that grain mites were of much less importance in 1942.

The control measures used in the control of grain mites varied with the location of the problem. In terminal elevators where cleaning equipment was available, the grain was cleaned, most of the mites removed, and the moisture content of the grain reduced. If more radical treatment were needed, the grain was run through the "dryer" to kill the mites and reduce the moisture content. Merely "turning" the grain often reduced the population materially and if the top and bottom of the bin were thoroughly mixed with the bulk of the bin, the remaining mites were so dispersed through the drier grain that further trouble rarely occurred.

In the annexes, the best control was fumigation with chloropicrin or carbon tetrachloride. Chloropicrin is quite toxic to mites at dosages as low as 1 pound per 1,000 bushels of grain, and its lachrymal properties prevent the operator exposing himself to harmful concentrations. While it is possible to secure kills with chloropicrin alone, better distribution of the fumigant is secured when the chloropicrin is diluted with a gallon of the carbon tetrachloride. Application was made just beneath the surface by means of short probes. Carbon tetrachloride alone at the rate of 2 gallons per 1,000 bushels of grain also gave quite satisfactory results.

For infestation in farmers' granaries, the shovelling over of the surface grain, putting the grain through a fanning mill, threshing machine, or combine, or the transfer from one bin to another, have aided in mite control.

Rusty Grain Beetle

THIS insect was a serious pest in both country and terminal annexes. Heavily infested grain heated badly and in some cases a temperature of 107°F. was achieved in wheat with a moisture content of only 12.5 per cent. The beginnings of these infestations was usually found in a small amount of "tough" grain from which the insects spread to dry sound grain. From a small beginning, such as a crack in the floor, the insects spread to form a cone of "hot" grain that extended to the surface, 45 feet above the floor. In winter, the surface grain above such a "hot spot" became damp through condensation and soon spoiled if not detected and removed. The type of infestation described required but a short time to build up, as heavy infestations have been discovered in grain which had only been in the annexes for a period of three months.

Fumigation of "hot spots" for the most part yielded only partial control and should be regarded as a holding measure. Fumigation in the earlier years was carried out with chloropicrin at the rate of 1 pound per 1,000 bushels of infested grain, and toward the end of the war, carbon tetrachloride alone was used at the rate of 2 gallons per 1,000 bushels of grain. When the grain was found to be infested, it was removed from the storage, cleaned to remove insects, and processed as soon as possible. Because of the structural features of the storage, it was necessary to move large quantities of grain in order to remove rather localized infestations.

Psocids

PSOCIDS have been recovered from Canadian grain at times, and in the past have been considered of little economic importance. They were frequently found in association with the rusty grain beetle in heating grain. Several cases of heating grain, infested with psocids alone, were discovered in terminal annexes. They were apparently able to cause dry grain to heat in the same manner as the rusty grain beetle.

Spider Beetle

SPIDER beetle infestations were frequently encountered in surface grain in country elevators and annexes during the summer months. Fortunately the feeding of the larvae was restricted to the surface layers of kernels and the damage to grain has been of minor importance.

The Rice Weevil

INFESTATIONS of this quite serious pest occurred in southern Manitoba during war years. No previous commerical infestation had been encountered. Surveys of the farms contributing the grain found to be infested with rice weevils were

(*Turn to Page 69*)

American Chemical Society Papers Cover

Insecticides Fungicides Herbicides Fertilizers

NUMEROUS papers on agricultural insecticides, weed killers, fungicides and fertilizers were presented at two of the three separate meetings which made up the 114th Meeting of the American Chemical Society. The cities in which the sessions were held were Washington, D. C., August 30 to September 3; St. Louis, Mo., September 7; and Portland, Oregon, September 13 to 15. More than 700 papers were presented, with chemicals for agriculture playing a prominent part in the discussions at Washington and Portland.

A symposium on chemicals for agriculture was held in Washington, Aug. 30. E. D. Witman, Sherwin-Williams Co., Cleveland, Ohio, in his paper, "2,4-Dichorophenoxyacetic Acid," stated that this material is not likely to be replaced by newer chemicals in the near future, but that some of the newer materials may complement 2,4-D to give better weed control. Mr. Witman gave a brief history of 2,4-D, pointing out that the preparation is not inflammable, explosive, nor toxic to animals. Its action is best on broad-leafed plants, he said, and annuals are more easily controlled with 2,4-D than perennial plants. Valuable crops such as wheat, oats, barley, rye, rice, sugar cane, flax, asparagus, strawberries, cane berries, potatoes and others are not susceptible to the poison. Certain precautions are important in application, he warned, and pointed out that low-gallonage application has found favor over former methods of distribution.

Through the use of plant hormones, it may be possible to change the adaptation of crops by altering the growth rate or maturity, modifying the form, yield, and composition, according to a paper, "Plant Growth Regulators," by R. L. Weintraub and A. H. Norman of Camp Detrick, Md. The authors pointed out that plant growth regulators are not essential for growth, but have the properties of inhibiting, initiating, or modifying growth of certain plant parts. The most outstanding practical application of this class of compound has been the development of 2,4-D as a herbicide, but other uses include the initiation of rooting, induction of flowering, parthenocarpic seed setting, delayed fruit abscission, etc.

S. A. Rohwer and R. A. Fulton, U.S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, discussed "Liquefied Gas Insecticidal Aerosols" for use in greenhouses and the field and also for household use. The fast post-war development of the method was discussed, with the fact pointed out that much of the progress has been stimulated by the discovery and availability of new insecticidal chemicals such as tetraethyl pyrophosphate, and new propellents such as fluorine derivatives of ethane. Whereas the insecticidal ingredients formerly used had to be harmless to man, since they were usually dispersed in closed spaces, it is now possible to use highly toxic materials with reasonable safety in greenhouses., where appropriate safeguards are used.

Dr. H. L. Haller, U. S. Department of Agriculture, presented a paper prepared by himself and Ruth L. Busbey, discussing the chemistry of some of the newer insecticides. Physical and chemical data are needed to aid in the formulation of finished insecticides, since few of the newer insecticidal chemicals are suitable for use in undiluted form. Such information is also needed for the development of methods for the detection and estimation of the chemicals, both in the finished insecticides and as spray residues.

The development of many of the synthetic organic compounds was traced, including DDT and its analogs, BHC, chlordane, chlorinated camphene, bis (p-chlorophenoxy) methane, 1,1-bis (*p*-chlorophenyl) ethanol, tetraethyl pyrophosphate and

parathion. Also mentioned were a number of preparations which have proved useful in combination with plant insecticides such as pyrethrum.

Physical and chemical data for the new compounds were presented, including information on the preparation, stability, compatibility and methods of analysis.

Advantages of the Chemical, Biological and Toxicological Properties of Methoxychlor as an insecticide were discussed by C. J. Krister, E. I. duPont de Nemours & Co., Inc., Wilmington, Del. Its rapid "knock-down" action against certain insects, particularly various species of flies, its favorable physical properties and low phytotoxicity make Methoxychlor an insecticide "approaching the ideal" for numerous pest control uses, he said.

The relatively low toxicity to warm-blooded animals and its effectiveness in controlling certain insects, make the preparation outstanding, Mr. Krister said. Oral toxicity is so low that accurate determination of its LD-50 has been impossible, but it appears that the minimum fatal dose for rats is at least 6,000 mg. per kg. Experiments have shown that the material is not readily absorbed through the skin of animals, nor has it been found in the milk of methoxychlor-treated cows. Very little of the material is stored in fatty tissues. Against certain agricultural pests, such as Mexican Bean Beetle, the material has shown effectiveness. A greater margin of safety on cucurbits and beans is seen, and the preparation appears useful on fruit crops, also.

Dr. S. E. A. McCallan, Boyce Thompson Institute for Plant Research, Inc., discussed the fungicidal action of copper and sulfur, presenting a number of the more recent theories on the nature of their actions. Copper, sulfur, and Bordeaux were discussed, as well as a number of theories regarding plant exudates and the effect of atmospheric agencies on the action of the various fungicides. The dithiocarbamate fungicides exhibit characteristic double maximum dosage-response curves in their action, and their action is postulated in the first case as a liberation of hydrogen

Group's 114th meeting held from August 30 to September 15 in three cities. Agricultural chemical papers presented at St. Louis and Washington Sections. Other sessions at Portland, Oregon. Over 700 papers presented.

sulfide, and secondly as a formation of metal salts from essential trace metals, he pointed out.

The use of quinones as fungicides was related in a paper prepared by D. L. Schoene, H. D. Tate and T. W. Brasfield, U. S. Rubber Co., Naugatuck, Conn. Out of the several hundred quinones and quinoid compounds examined in the past few years, a number are active fungicides.

Tetrachloro-*p*-benzoquinone has found widespread application as a seed protectant to prevent seed decay and damping off, the paper said. It is particularly useful on peas, beans and lima beans; is nontoxic to mammals; noninjurious to seeds, and is compatible with legume inoculants.

Another quinone, 2,3-Dichloro 1,4-naphthoquinone, is exceptionally active among the organic fungicides both as a seed protectant and as a foliage spray. It is effective on most seeds, but particularly so on corn, beets, peanuts and rice at dosages ranging from 0.25 to 1 ounce per bushel. As a foliage spray it controls apple scab, bitter rot of apples, brown rot of stone fruits, late blight, and certain other fungus diseases.

The history of fertilizer research in the U.S.D.A. was outlined by R. O. E. Davis, Bureau of Plant Industry, Soils, and Agricultural Engineering, U.S.D.A. He recalled that the investigations on potash, the processing of phosphate rock to produce phosphoric acid and available phosphates, and the synthesis of ammonia made possible the use of high grade materials to formulate mixed fertilizers with higher percentages of plant food. These accomplishments provided the basis for the conversion of fertilizer manufacture into a chemical industry, he said. The quality of fertilizers has constantly improved through the cooperation of the industry, the Federal government, and state agencies, it was pointed out.

Two papers prepared by R. C. Crippen and Leonard Buchoff, Penniman & Browney, Inc., Baltimore, Md. were presented. The first discussed the use of green manganous oxide in agriculture, and the second, the use of thiodiglycol in agriculture.

The first paper indicated that experiments in the laboratory, greenhouse and field have confirmed previous observations that green manganous oxide use as a trace source for manganese in fertilizers, has certain advantages. It dissolves slowly in soil solutions from pH ranges 5.5 to 7.8 thus not producing toxic concentrations as with completely soluble manganese salts.

Thiodiglycol has been used in agricultural sprays as a sticking agent, emulsifying agent, and spreading agent in the form of its fatty acid esters. Heavy oily esters of 2,4-D have been prepared which show promise as long-time acting weed killers.

Fertilizer Sessions

THE presentation of a number of interesting papers on fertilizer chemistry featured the sessions of August 31 and September 1 in Washington. Jackson B. Hester, Campbell Soup Co., Riverton, N.J., chairman of the section, presided at the Tuesday session; and Vincent Sauchelli, Davison Chemical Corp., Baltimore, secretary of the section, presided at the second day's meeting.

Papers included such subjects as the History and Progress of Phosphate Flotation, by James A. Barr, Jr. Armour & Co., Chicago; Processing Phosphate Rock, by T. L. Wilkerson, American Cyanamid Co., Toccoa,

Ga.; and Phosphate Processing at Trail, B. C., by James Atwell, Consolidated Mining and Smelting Co. of Canada, Ltd.

William T. Doyle, Sturtevant Mill, Dorchester, Mass., in his paper on "Modern Trends in Superphosphate Manufacture," said that the forseeable trend for the future in superphosphate manufacture appears to be along the lines of continuous operation covering the finished product as granulated superphosphate as well as complete mixtures. He recalled the history of the process, beginning with the early days in Europe when superphosphate was made from either bone or mineral phosphate mixed with sulfuric acid in a very crude manner. The continuous den system was developed in Europe, but was slow to be adopted in the U.S. At the present time, he said, there are some 15 continuous den systems in use in the United States.

The increase between 1940 and 1946 of nearly 400 percent in the use of finely ground phosphate rock for direct application fertilizer purposes is due to four factors, according to a paper by T. R. Cox and M. V. Bailey of American Cyanamid Co., New York. These factors include the wider recognition of direct application rock as a supplement to superphosphate; a shortage of superphosphate in the midwest; use of direct application under the agricultural conservation program in a number of states; and increased equipment for bulk handling of direct application rock.

General conditions under which direct application rock may be used profitably were listed as soils which are slightly acid; systems of farming where deep-rooted and other legumes occupy the land about half of time; and where supplemental fertilizers containing superphosphate are now used on row crops, small grains, and most non-legume crops.

Radioactive Tracers

USE of radioactive phosphorous as a tracer to determine the utilization of applied phosphate by plants, was described in a paper by W. L. Hill, E. J. Fox and J. M. Mullins, U.S.D.A. Greenhouse experiments were begun on a small scale in 1946, but a year later the experiments were expanded to comprise five radioactive phosphate materials and eleven crops in five states. The fertilizer requirement of from 700 to 800 pounds of radioactive phosphates necessitated provision of special equipment in an isolated room for their preparation.

The basic problem consisted of the dilution of a very active phosphate (KH_2PO_4) with inactive phosphate and the complete conversion of the mixture into the desired form. Conventional methods of mixing phosphates were used, with suitable modifications to provide recovery of the material in the batch and to protect the operator from exposure. Choice of technique was made almost entirely upon the basis of safety to the operator, so processes requiring the fewest transfers of material were most desirable.

The stability of 2,4-D in mixed fertilizers was discussed in a paper prepared by Paul C. Marth, John O. Hardesty and John W. Mitchell, U.S.D.A. Mixtures of 2,4-D with 10-6-4 fertilizer may be stored for as long as 10 months without loss of potency, according to experiments. The mixtures were stored in both high and low temperatures (from 30°C to 60°C), and at intervals up to 10 months, aliquots from each batch were removed and applied at the rate of 600 pounds of fertilizer and three pounds of 2,4-D per acre to weedy sod plots of 50 square foot area. For comparison, freshly prepared mixtures of fertilizer and 2,4-D were applied, as was fertilizer alone. Data collected on the fresh weight of clippings of both grass and weeds obtained after 3 and 10 months of storage showed no significant differences among the fertilizer-2,4-D treatments. The average percentage of weeds in the total weight of clippings was 1.5 or less from plots receiving 2,4-D regardless of the method of storage. Comparable unfertilized control plots averaged 22.4 to 47.4 percent weed clippings by weight. Because of the effect of the fertilizer and the lack of weed competition, the grass in the plots treated with the mixtures containing 2,4-D showed significant increases in yield.

Dr. K. D. Jacob, U.S.D.A. and R. W. Cummings, N. Carolina Agricultural Experiment Station, Raleigh, presented a paper on the progress of fertilizer manufacture in bizonal Germany They stated that although major attention is being given to the problem and considerable progress has been made in the past two years, it appears that the production of fertilizers, especially phosphates, will not meet the requirements of the country until after 1951. The paper pointed out that before the war, the manufacture of fertilizers, except nitrogen, exceeded the consumption in the area. Since then, production has been drastically reduced by damage to plants, shortages of repair and building materials, equipment, power, transportation and labor; insufficient supplies of coal, and decreases in manufacture of coke and steel.

The relation between plant nutrients removed from soils by harvesting crops, and replaced in fertilizers and manures was described in a paper by A. L. Mehring, U.S.D.A. He stated that farmers in the eastern states are adding more nutrients in the form of fertilizers and manures than they are removing through crops, whereas in the western states, only a fraction is being replaced in most cases. The northern states use much more animal manure as fertilizer than do the southern states, he said.

More P_2O_5 is being added to soil of the U.S. as a whole than is being removed in the harvested portions of crops, but only about two-thirds of the nitrogen and K_2O removed is being replaced in this way.

Other factors are involved in maintaining soil fertility, but this study indicates that in general nutrient ratios of fertilizers should be changed to provide more nitrogen and K_2O in proportion to P_2O_5 for the most efficient results under present conditions, although numerous exceptions to this generalization exist.★★

Experiment Station Digest

By H. H. Slawson

FLORIDA Agricultural Experiment Station, at Gainesville, Fla., last year tackled the problem of ridding vegetation of Spanish moss, whose shading effort retards growth. A satisfactory kill of the moss was obtained by using a bordeaux mixture composed of 10 lbs. copper sulphate and 2 lbs. lime to 100 gallons of water; also by using arsenate of lead at 2 lbs. to 100 gallons. Final recommendations were deferred until it could be determined whether plants to be sprayed can tolerate the concentrations required to kill the moss.

Noting that when cattle were sprayed with DDT for hornfly control, this insecticide also had a marked effect on the Gulf Coast cattle tick, tests were run on 100 yearling grade Angus heifers to determine the relative effectiveness of DDT sprays and the best two available ear smears commonly used against the ticks. After detailing procedures, the report concludes that "These results indicate that a full coverage DDT spray is fuly as effective against ear ticks as the best available ear smears."

Cattle grubs were destroyed readily at the Florida station by spraying the backs of cattle with a mixture of 1 lb. derris or cubé powder, which contained 5 percent rotenone and 2 lbs. wettable DDT to 10 gals. water. The treatment must be applied with at least 400 lb. nozzle pressure, or the backs must be scrubbed with a stiff fibre brush to loosen the scales so that the material can penetrate the grub holes, the report advises, and two or three treatments are essential for complete control.

Liver fluke disease, which kills cattle or results in lower market prices for infected animals, is caused by a microorganism carried by snails living in water used by cattle. Attacking this problem, Florida investigators found that copper sulfate, applied at a rate of 24 lbs. per cubic foot flow of water per second killed all snails within the distance it flowed in 24 hours—usually one mile. This chemical also destroyed all snails when applied to ponds, sloughs or wet areas at a rate of 20 lbs. per acre foot.

One part of copper sulfate was mixed with 6 parts of dry earth for ease of distribution and the report advises that the treatment should be repeated in 21 days, to destroy newly hatched snails, since the chemical is not destructive to snail eggs.

A new type of soil fumigant (bead-like capsules containing pure ethylene dibromide) was tested in comparison with three commercial materials—"DD," "Dowfume W 10" and chloropicrin— and it was concluded that the new method of application is about as effective in reducing root-knot as the other materials, used at comparable rates.

Other tests were run with a number of soil fumigants to determine their effect on yield and quality of squash, cucumbers, peas, strawberries and watermelon. Various effects, both plus and minus, were reported on yield but no variation in quality of vegetables was observed due to soil fumigation treatment. During the tests with peas, weed counts indicated that two fumigants, "Larvacide" and "DD," greatly reduced stand of nut grass.

Three different dusts and three sprays were tested for control of downy mildew on cabbage. "Spergon" spray (4 lbs. wettable "Spergon" in 100 gals. water) and 12 percent "Spergon" dust gave approximately the same control of mildew and were about twice as effective as zinc ethylene bis-dithiocarbamate spray, which ranked next. Poor control was obtained with other materials used.

Two DDT formulations (emulsifiable oil and 20 percent dust) gave consistent control of mole crickets in seed beds at rates low enough to make them economically practical, the Florida station reports. As little as 5 lbs. per acre of actual DDT gave measurable control, while larger quantities gave better control over longer periods.

For gladiolus growers tests were run of some organic fungicides on Picardy corms to note their response as measured in Fusarium disease control and flower and corm yield. New materials listed as "promising" for control of Fusarium yellows and rot disease and reported less injurious than the mercurials commonly used, include "Fermate," "Dithane" and "Parzate," "Dowicide B" and Dow seed protectant "9 B," and "1451 GGG." Among other fungicides tested, "merthiolate" produced the largest number of marketable spikes from old diseased Picardy stock of any treatment tested, states the report.

For weed control in gladiolus beds a sodium or ammonium salt of 2, 4-D, at a concentration of 1 to 1,000 was not toxic to gladiolus, when sprayed on bulblet stock within 4 to 6 weeks after planting. Broadleaf weeds and nut grasses were not controlled. No evidence of injury was found under varied experimental conditions, as measured by stand count, or number and weight of corms harvested.

DDT was recommended for control of thrips and other insects attacking gladiolus. BHC may be used on growing stocks for thrip control, the report adds, but not on flowering stocks, where its musty odor may be objectionable. Where spraying is not possible, a combination DDT and BHC dust or a toxaphene dust were suggested.

In work on citrus fruit insect problems, various valuable results are reported from the Florida station. DDT is absorbed into the leaf in larger amounts when sprayed on with oil than when applied in a wettable material, it was found. The DDT present on surfaces of oil-sprayed leaves, it is explained, is lost more slowly than on leaves sprayed with the wettable material, while the absorbed material apparently is not decomposed very rapidly.

Copper-oil emulsions deposit satisfactory amounts of oil and should

give good scale control, if applied properly, it was determined. Subsequent residual amounts of copper were larger for the copper-oil materials, throughout the critical period, than for bordeaux solution and a neutral copper material.

Increase of Florida red scale on DDT-sprayed citrus trees, it was decided, resulted because the insecticide killed beneficial insects, thus allowing the scale population to increase very rapidly. Significant findings are reported on studies of use of various chemicals to control stem-end rot and molds on citrus fruits during the marketing period.

Using an aerosol generator, DDT applied to cattle gave satisfactory control of hornflies at the Florida station but did not appear effective against mosquitoes.

Aerosol applications of DDT reduced ramie leaf roller population by 91.7 percent at 50 feet from point of dispersion, and 87.3 percent at 100 feet. At greater distances the control was ineffective.

Used against corn earworms and corn budworms on sweet corn, the aerosol method failed to give a satisfactory control in a single test. In one tests of DDT applied to snap beans in full bloom for control of Florida flower thrips, the reduction of thrips at 25 feet from point of liberation was 70.5 percent; at 50 feet, 35.2 percent; and at 75 feet, 23.4 percent.

Among the Florida station's 260-page review of 1946-47 activities, much other important matter is presented covering insect control work on sugar cane, vegetables and other crops. Also announced are results from a survey of one 1946 project, involving an intensive airplane spraying program with 2,4-D to kill water hyacinth. The effort, says the report, removed approximately 60 percent of the original dense water hyacinth cover in the main arterial canals of the Everglades area.

Iowa Station Reports

IOWA station at Ames reports that in a series of exploratory experiments in potato fields, it was found possible to take bordeaux mixture or the Red River Valley Potato Mix and add DDT and 2,4-D to it. In this way it was possible to control potato blight, the leafhopper and weeds with one spray. It appeared, also, that 2,4-D could be effective against weeds when potato plants have grown too large to be cultivated without injury.

Corn sprayed with "Weedone" did not show any detrimental effects when 12 to 18 inches high. Later on, when tassels were showing, the plants bacame twisted "into all sorts of shapes," and corn yield was materially reduced.

Peas 8 to 12 inches tall were sprayed with "Sinox" and "Dow Selective" for weed control by the Iowa investigators and average yields of green peas per square rod were compared with yield from a hand-weeded plot. Score—"Sinox," 30.6 lbs.; "Dow Selective," 20.1 lbs; hand-weeded control, 24.1 lbs.

Oats were sprayed with four different herbicides and average acre yield was reported as follows; "Sinox," 78.7 bu.; "Santobrite," 70.4 bu.; "Weedone," 68.1 bu.; "Dow Selective," 71.0 bu.; unsprayed control, 77.7 bu. Differences were not sufficient to be considered significant, but it was noted that in sprayed areas there were no weeds to interfere with combining.

Comparative results with herbicides on carrots, onions and asparagus seedlings are reported in similar detail and 2,4-D is commended to Iowa farmers for killing weeds in fence lines. But Iowa experiences led to the conclusion that it is impossible to kill Canada thistles with one application of 2,4-D. With two applications, says the report, a 70 percent reduction can be expected and a 90 percent reduction with three applications, while thistles mowed in early July and treated in late September, produced a 60 percent reduction in stand.

Iowa station studies of fumigants for insect control in grain bins, in progress for several years, led to a tentative conclusion that frequent failure of fumigants in corn bins may be due to wet surface layers of grain. Further experiments to check this were started, following which a manuscript was promised, provisionally to be titled, "Effect of Moisture on the Toxicity of Fumigants in Shelled Corn."

The Iowa station devoted some attention to use of light petroleum fractions as diluents for fumigation mixtures. Regarding one such material, *Spirits of Oleum*, which is also used in fly sprays, the report says: "The results of these preliminary tests indicate that such light petroleum fractions as *Sp. oleum* reduce the toxicity of the fumigant mixtures at concentrations as low as 5 to 10 percent. Commercial mixtures which contain a greater proportion than 10 percent of light petroleum oil, do not seem suitable for the fumigation of shelled corn."

DDT in New Mexico

NEW Mexico station at State College, N. M., endorsed DDT for codling moth control in the hot, dry climate of that state, provided it is used in combination with other insecticides, as outlined in the progress report on this subject. Each of the six combinations tested gave excellent control of codling moth and resulted in from 94.2 to 99.5% of the fruit in the experiment being marketable.

New Mexico station reports that use of benzene hexachloride gave good control of pea aphis, where other stations have reported only moderate effects with DDT. The BHC was also used against the walnut aphis on pecans and where a 2.5 percent dust was used there was an 81 percent kill of adults and 80 percent of nymphs. Where a 5 percent dust was used, all adults and 97 percent of the nymphs were killed.

Regarding use of 2,4-D for weed control, New Mexico's report says:

"Bindweed apparently can be eradicated by several sprayings of 2,4-D, but not by one spraying. 2,4-D was more effective against bindweed in a mixture of Johnson grass than it was against bindweed alone. The use of sulfur dioxide and ammonia to lower the pH of the solution resulted in a quicker kill, but it did not seem to affect the later new growth. Both Johnson grass and bindweed made almost complete recovery after being treated.

The Listening Post

Weather and Wheat Disease in Northwest

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

EXTREMELY wet crop season extending from September of last year was generally beneficial to cereals in the usually semi-arid areas of eastern Washington, but caused serious erosion, drowning, and disease problems in the Palouse region and adjacent parts where rainfall was excessive, according to Roderick Sprague of the State College of Washington.

Cercosporella foot rot of wheat, caused by *Cercosporella herpotrichoides* was widespread in winter wheat, but somewhat spotted in the fields and often confined to swales or areas with lush grain. In such places the wheat was 100 percent fallen over, with small heads and reduced yield. Foot rot was found in areas where it did not occur ten years ago. It was present in all the southeastern counties, from Spokane and Lincoln south to Asotin and west to Klickitat and Yakima Counties. On High Prairie in the Columbia Basin it was virtually absent where it had formerly been serious, partly because the top soil has eroded heavily and foot rot does not thrive in the white sub-soil, and partly because the formerly most heavily affected fields are now seeded mainly to alfalfa.

Dry land rot caused by *Helminthosporium sativum* was widely scattered in the drier areas in winter wheat. In the Palouse region spot blotch on the leaves, an unusual symptom for this area, was common. Dry land root rot caused up to 15 percent loss in fields of winter wheat in the Horse Heaven country of Benton County.

Extensive patches of take-all, caused by *Ophiobolus graminis*, appeared very late in the season in winter wheat in Whitman, Garfield, and Columbia Counties. This is the first report of take-all in such large amounts in eastern Washington, although there have been scattered reports in the past. The combination of erosion of top soil, leaching of nitrogen, and excess moisture, probably was responsible for this late season attack.

Growers and agronomists had difficulty in distinguishing between *Cercosporella* foot rot, take-all, and just plain drowned wheat. The last was confined to clay areas in low places. Sometimes the water stood in these spots until mid-June. As a result the wheat died, or managed to reach a height of 8 to 18 inches with a mass of dead tillers surrounding one or two surviving stems.

A large area of spring seeded wheat extending from somewhat north of Dayton to the vicinity of Walla Walla was severely stunted by the root browning fungus, *Pythium graminicola*. Seedlings showed unusually severe injury, and even death. The plants failed to recover properly and at the end of June the fields showed large areas of thin plants with pale green foliage and generally stunted growth. The combination of poor seed bed, heavy rains, and leaching probably favored this attack. The loss in this area probably was at least 300,000 bushels. It emphasizes the paradoxical nature of the season. For instance, northward in the Ritzville area or even in the drier Connell sector, fields extended for miles in all directions with 30-bushel to the acre prospects and waist-high grain.

Snow mold, due to species of *Typhula*, caused almost complete winter killing of wheat foliage in Douglas County and less severe injury eastward. However, wet weather favored recovery and fair yields were expected in most affected fields.

Other diseases more than usually abundant were leaf rust (*Puccinia rubigo vera* var. *tritici*), which was severe in the Palouse and in all but the drier parts of central Washington; stripe rust (*Puccinia glumarum*), on the variety Orfed but less serious in some other kinds; speckled leaf blotch (*Septoria tritici*), which had only been seen once or twice formerly but this season was present in all but the drier parts of eastern Washington and was abundant in the Palouse; *Selenophoma* leaf spot (*Selenophoma donacis* var. *stomaticola*), which appeared in a wide area in the Palouse in Washington and Idaho although this was the first time it had been found in this country; and powdery mildew (*Erysiphe graminis* var. *tritici*) which was very prevalent in the Palouse and in winter wheat in other areas except in the drier portions. During a survey powdery mildew was found in great abundance in Washington from Pullman to Walla Walla and in Oregon from Athena to Pendleton. In some fields it was especially severe on wheat that had been sprayed with 2,4-D to control weeds.

On the other hand bunt or stinking smut (*Tilletia spp.*) was scattered and much less severe than average.

2,4-D And Citrus Decay

IN experiments at the Louisiana Experiment Station reported by J. Guiscafre-Arrillaga, a proprietary brand of 2,4-D "(Dow 70)," containing 70% of the acid and 30% $NaHCO_3$ was included in one of the trials of various chemicals as possible

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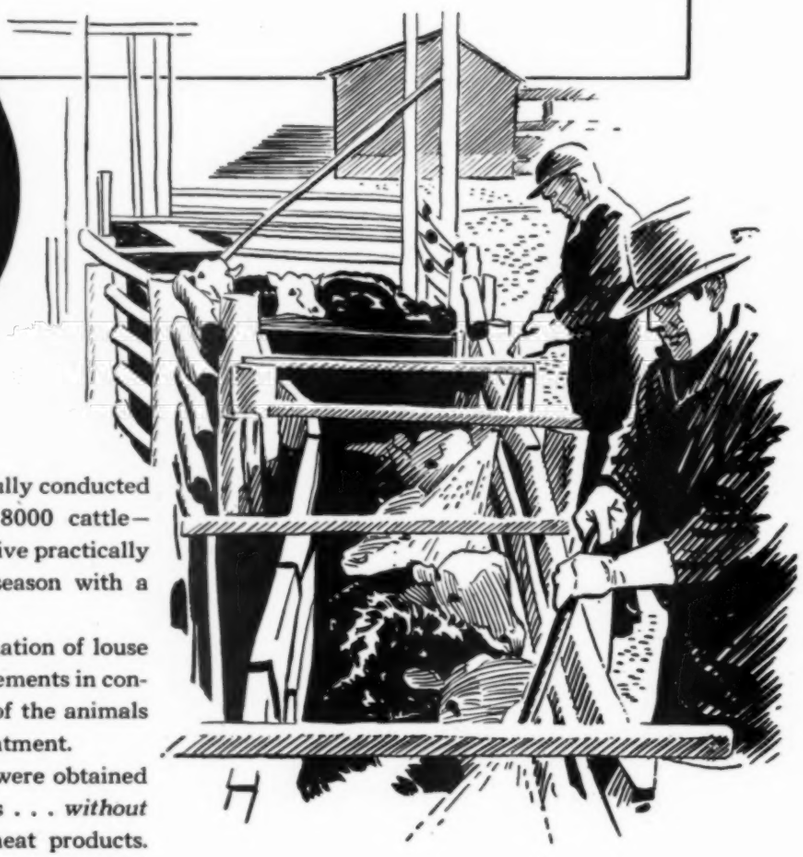

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inhibitors of postharvest decay of citrus fruit. A marked decrease in decay occurred in oranges dipped for periods of 3 to 5 minutes in 0.1% to 0.5% solutions of this formulation. In later tests similar results were obtained with the same dilutions of another brand (DuPont) containing 75.9% acid equivalent of the sodium salt.

Rotting of non-treated fruit ranged from 14 to 25 percent in one week and over 50 percent in three weeks; fruit dipped in 0.1% solution showed 0 to 8 percent decay in one week; fruit dipped in 0.2% to 0.3% solution showed no decay in one week and an average of 10 percent decay in three weeks.

In other tests, approximately 10 grams of the dry material, "Dow 70," was scattered at the bottom of the fruit container (½ bushel crate), covered with a layer of filter paper, and the fruit placed over it. An ethyl ester of 2,4-D (35.2% acid equivalent) was also used, 10 cc. of the undiluted ester being soaked on filter paper which was placed at the bottom of the fruit container and the fruit packed over it. Marked reduction in fruit decay was obtained by these treatments: no rotting occurred in the first week, with an average rot of 16 percent in three weeks, compared with over 50 percent rot in untreated fruit during the same period. A faint odor of the 2,4-D was perceptible on the rind of the fruit, but the taste of the interior was not affected. Apparently the 2,4-D was absorbed by the outer layers of the rind.

The most common decay in these tests was that caused by the green mold *Penicillium digitatum*. Experiments to determine effect of 2,4-D in germination of spores of this fungus showed that in liquid solution at the concentrations used, it exerts a strong inhibitory action. Comparative figures on spore germination with various treatments were: no treatment, 82 to 91 % germination; standard Bordeaux mixture, no germination; 2,4-D in 0.1 to 0.3% solutions, none to 20% for "Dow 70," none to 9% for the DuPont product. It was not determined whether the 2,4-D killed the spores or simply stopped their growth. The fumes of 2,4-D ethyl ester also exhibited inhibitory action on spores of *P. digitatum;* the spores germinated but the germ tubes were short and distorted and it was noted that no further growth took place.★★

Insect Situation in Late August, Early September

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Haeussler is in charge of Insect Pest Survey and Information, Agric. Research Adm., B. E. & P. Q., U.S.D.A. His observations are based on latest reports from collaborators in the department's country-wide pest surveys.

By G. J. Haeussler

GENERAL conditions have been so favorable for cotton that in most areas good crops have been produced in spite of the presence of numerous insects. The more widespread use of the newer organic insecticides has undoubtedly been an important contributing factor. Boll weevils have been building up in large numbers and it now appears that there will be many weevils going into hibernation over most of the infested area. From data available, the insect situation appears to have been somewhat worse in Texas and Oklahoma than in the other cotton growing states. The bollworm destroyed much cotton in central and northern Texas, and over large areas of Oklahoma during August. This insect was reported damaging cotton to a less degree in New Mexico, Arizona, Arkansas, and other states. The fall armyworm caused considerable damage to bolls in all the southeastern states. The yellow-striped armyworm, sometimes referred to as the cotton boll cutworm, was also reported causing damage in several cotton-growing areas. The tobacco budworm appeared to be unusually abundant as a cotton pest during August and early September. Reports covering damage to cotton by this pest were received from North Carolina, South Carolina, Georgia, Mississippi, and other states. A rather severe outbreak of salt marsh caterpillars was reported from some areas of Texas toward the middle of September.

Slight infestations of the velvetbean caterpillar continued during the last half of August in Louisiana, Alabama, northwest Florida, southern Georgia, and as far north as Charleston, South Carolina. Heaviest infestations during that period were reported from Baldwin, Henry, and Mobile Counties, Alabama, where some dusting was carried on to protect kudzu and peanuts. By the end of August a widespread, serious outbreak of this appeared unlikely, and insecticide supplies were apparently adequate to meet any needs that might develop.

The fall armyworm was causing serious damage in Georgia during the last half of August to sudan, corn, alfalfa, lawns and pasture grasses. It caused serious damage to peanuts in Bulloch County of that state. It was also reported to be causing serious damage to late planted corn in the Shreveport, Louisiana area; to corn and grasses in Oktibbeha County, Mississippi; and to peanuts in Hertford and Bertie Counties, North Carolina. Infestations of this pest appeared to be general from Virginia south to Georgia, Alabama, Mississippi, and Louisiana.

During the period from the middle of August to the middle of September, moderate to heavy populations of the Mexican bean beetle occurred in parts of New Jersey, Virginia, Georgia, Florida, and Tennessee. Lighter infestations prevailed gener-

(*Turn to Page* 59)

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Reproduction of one of a series of posters that was on display at the AIFA 15th annual meeting, Spring Lake, N. J.

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Suppliers' Bulletins

New Type Sprayer

Chapin Mfg. Works, Inc., Batavia, N.Y. has announced production of a new type of pressure sprayer suitable for use in applying various agricultural chemicals such as 2,4-D, insecticides, and fungicides. Hand pumping is eliminated since constant pressure is provided from a CO_2 gas cartridge.

The gas cylinder is mounted on the outside of a three gallon galvanized tank, which permits the tank to be filled to capacity. This arrangement allows 25 to 30 percent more spray material to be carried. The gas cylinder contains 10 ounces of liquied CO_2 gas which is sufficient for spraying 15 gallons of pesticide material.

Literature is available from the R. E. Chapin Manufacturing Works, Inc., Batavia, N. Y.

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Weed Killer Bulletin

Standard Agricultural Chemicals, Inc., Sacramento, Calif., has prepared a folder as a guide to weed killers for use with the firm's 2,4-D and dinitro herbicide products. The folder lists a number of crops and stages, with weeds to be controlled, and offers suggestions for proper concentrations under given sets of circumstances. Copies of the folder are available from the firm, 439 Forum Bldg., Sacramento Calif.

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P-D Sulphate Booklets

Phelps-Dodge Refining Corp., New York, has issued two bulletins on basic copper sulphate and zinc sulphate. The folder on basic copper sulphate explains the properties of the material in plant disease control, and lists a number of crops and diseases on which the fungicide is effective, and its compatibility with insecticides. The material is prepared in both spray and dust form.

The zinc sulphate folder presents information corresponding to basic copper sulphate, in describing properties, and the proper uses of the material. In addition, full instructions are given on the preparation of zinc sulphate sprays. These bulletins are available from Phelps Dodge Refining Corp., 40 Wall St., New York 5, N. Y.

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New Solution Dispenser

Precision Scientific Co., Chicago, has issued literature on its new solution dispenser which is developed for fast and accurate measurement of solutions used for routine testing. The makers state that accurate deliveries can be made up to 100 ml. The instrument can be applied to any test where measured quantities of liquids must be dispensed, such as Kahn test, biological assays, water analyses, plant control testing, etc. Over all dimensions are approximately 32" high, 10" wide and 13" deep. Printed information is available from the company, Chicago 47, Illinois.

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Attrition Mill Folders

Sprout, Waldron & Co., Muncy, Pa., have just issued three new bulletins describing the firm's "double runner" attrition mill. Construction details are given along with photographs of the machines and specifications for various types of jobs. Ask for folders No. DRC-1; DR-448 and DR-442, Sprout, Waldron & Co., Muncy, Pennsylvania.

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Bag Closing Literature

A complete line of machines for closing multiwall paper bags is described in an 8-page folder issued by the International Paper Company, Bagpak Division. The machines illustrated will close up to 15 multiwalls per minute. Tape may be pasted over the closures, making them moisture-resistant and proof against contamination, infestation and sifting. Closures are made with the "cushion-stitch." Folder copies are available from International Paper Company, Bagpak Division, 220 East 42nd Street, New York 17, New York.

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L. A. Proposed Regulations

The September issue of "Plant Food Facts" issued by the California Fertilizer Association contains a comprehensive draft of the proposed dangerous chemical regulations of the City of Los Angeles. It is of interest to the fertilizer trade, since it includes regulations covering calcium nitrate, sodium nitrate, ammonium nitrate, sulfur, and ammonium nitrate (over 50 percent). A limited number of copies of "Plant Food Facts" are available from the C.F.A., 530 W. Sixth St., Los Angeles 14, Calif.

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New Fungicidal Lotion

A new product designed primarily for veterinarian use and stated to have insecticidal and germicidal properties as well as its main purpose as a fungicide is being put on the market by E. J. Fay, New York, under the name of "Fay's Fungicidal Lotion." The product is based on dihydroxydichlorodiphenyl methane and contains pyrethrum extract as an insecticide. The new lotion, according to the manufacturer, is non-toxic, non-irritating and free from offensive odor. It is recommended for use on pets as a defleaing and delousing agent, and for treating of kennels, stables, and similar places. The manufacturer is located at 256 West 31st St., New York.

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"Chemette" by Eston

Eston Chemicals, Inc., Los Angeles, has published a bulletin called "The Chemette," a chemical news letter for circulation in the industry. The first issue, dated September, contains information on greenhouse aerosols, and a discussion on its products "Tetron" (tetraethyl) pyrophosphate) and "Alkron," (parathion). Copies are available from the company, 3100 East 26th St., Los Angeles 23, Calif.

Technical Briefs

Test New Grass Killers

Because grasses, especially quack grass, are often a serious problem in horticultural crops, such as strawberries and other small fruits, research specialists at Michigan State College have been seeking means of chemical control.

Tests have been carried on in the greenhouse by R. F. Carlson and J. E. Moulton of the Department of Horticulture to find an herbicide effective when applied to the foliage of grasses. They are making their results available at this time even though they are preliminary in nature, because of the interest in grass killers and because each report is another step in progress.

Water-soluble compounds such as trichloracetic acid (referred to as "TCA") and ammonium thiocyanate, as well as Herbicide "PB," were sprayed on the grasses. Applications were made at various stages of growth from the time of planting until the grasses were a foot tall.

Results showed that approximately 150 to 200 pounds per acre of the ammonium and sodium salts of TCA were required for a complete kill of well established grass. Lower rates of 20 to 40 pounds per acre controlled the young grass and retarded the taller and older grasses. The leaves gradually changed in color from a light green to a dark green and after four weeks they withered.

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Army Worm Control

Use of chlorinated camphene ("Toxaphene") in controlling army worm in alfalfa and hay in Kent County, Delaware has proved to be effective, according to reports by W. E. Tarbell, Kent County Agricultural Agent. One field was treated with a dust containing 20 percent "Toxaphene," at a rate of 20 pounds per acre with a tractor-drawn bean duster. The activity of the worms apparently stopped immediately, according to the report, and within 36 hours, the worms were killed. Dusting with ground equipment with "Toxaphene" dusts is successful enough so that control prospects for army worm are brighter, Mr. Tarbell commented. "Should plane application prove as effective, farmers would be able to cut down the destruction of this insect," he concluded.

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DDT Resistant Flies Killed

Non-laboratory flies which had apparently become resistant to DDT were killed by chlordane at dosages of 144, 110 and 70 mgms. per square foot of surface, whereas DDT at the same dosages killed only 12 percent of these flies after fifteen minutes. DDT did kill all of the laboratory-reared flies, however. These tests are reported in New Jersey Agricultural Experiment Station bulletin #742, by G. W. Barber and J. B. Schmitt, Rutgers University, New Brunswick, N. J.

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New 2,4-D Oil Spray

A new citrus spray containing oil-soluble 2,4-D that reduces the danger of handling this material in West Coast citrus groves was announced recently by Shell Oil Company, Inc., San Francisco. The product is called "Endrop C (containing 2,4-4)" developed especially for citrus growers, and trademarked by the Shell Company.

One of the first commercial sprays of this type, Shell "Endrop C" can be used to reduce the occurrence of citrus fruit drop, leaf-drop and fruit-stem die-back as recently suggested by the University of California Citrus Experiment Station at Riverside, California.

Realizing the danger of handling the potent 2,4-D weedkiller in or near citrus groves where it might be spilled on the ground or into irrigation ditches with the result that the fumes alone could cause extensive plant injury, the Shell Company has produced an oil spray containing such a small amount of 2,4-D that one quart added to 400 or 500-gallon spray tanks will give excellent results.

A simple mixing procedure is one of the advantages of the product. The required amount is added directly to the spray tank or it can be mixed with other spray oils, emulsions, solubles, or tank mix oils. Only four to eight parts per million of the 2,4-D ester are needed for an effective spray which can be applied with regular high pressure hydraulic spray equipment to fit into the citrus growers' regular spray program.

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Corn Borer Control

Control of corn borer in Indiana is reported in the Purdue University Agricultural Experiment Bulletin #338 for July, 1948. The report states that a 12-row, 500 gallon sprayer was used to apply the insecticides. Four applications of 125 gallons each were made at five day intervals with DDT, ground cube root (containing 5 percent rotenone), and ground *Ryania speciosa*. The nozzles were pointed downward on the whorl of the plant, while an extra wetting agent was added to cause the insecticide to run down behind the leaf sheath. The cube treated plot had an 80 percent reduction in borers and 31 percent increase in yield over the check; Ryania had a reduction of 95 percent in borers and a 34 percent yield increase, and DDT showed a reduction of 96 percent in borers and 18 percent increase in yield. The cost of four applications of DDT per acre, including materials, labor and depreciation on equipment, was about $6 (in 1945.)

"In most seasons corn planted between May 20 and June 5 will have the lowest corn borer population and still produce an excellent crop," the report says. It continues; "With the present low borer population, corn planted before this period probably will suffer but slight injury, but if necessary can be protected by insecticide treatments. Treatments may be justified in the protection of valuable crops, such as early-planted market sweet corn and in certain instances, canning corn for hybrid seed. The necessity of treating corn is difficult to predict in advance but all corn

plantings of high value planted in early May should be carefully examined in mid-June when egg masses are hatching. The height of the corn at that time is also important, as few borers can survive in small corn. In the case of early-maturing sweet corn such as Spancross and Marcross, larvae can survive in plants 18 to 20 inches high at hatching time, while in Golden Cross Bantam sweet corn and field corn, larvae can survive in plants 30 or more inches in height.

"Two materials have given excellent control in field tests of the corn borer larvae. These materials, DDT 50 percent wettable powder at the rate of 2 pounds in 100 gallons of water, or "Ryanex" at the rate of 4 pounds in 100 gallons of water, should be applied as a spray with all nozzles above the whorl of the plant. About 125 gallons of spray is applied per application at a pressure of 250 pounds. To aid in the wetting of the plant and the penetration of the insecticide behind the leaf sheath, ⅓ pound of wetting agent such as "Ultrawet E," should be added to each 100 gallons. One application, properly timed, will give a 50 to 60 percent reduction in borers and is considered the most practical for seed corn. On market and canning corn, however, a higher degree of control is necessary and four applications at five-day intervals are usually made. On the fourth application the two side nozzles are directed at the immature ears.

"The selection of the proper time for insecticide applications is difficult for growers and perhaps should be left to competent observers. The procedure is to examine the corn plants for egg masses between June 5 and 25 at three to five day intervals. If at any time 50 percent of the plants show the shot-hole feeding of the small larvae and 50 unhatched egg masses on 100 plants, sweet corn should be treated that day and on the fifth, tenth and fifteenth days thereafter. For the one application schedule on seed corn the application should be made the seventh day.

"Dusts containing 5 percent DDT applied with a ground duster are also effective, while applications by airplane are less effective but still of value."

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Emulsion Sheep Dips

One hundred sheep were dipped in an anionic emulsion having a concentration of 0.5 per cent of DDT. One half were dipped three times in the ensuing six weeks and put through a foot and head bath of a cationic emulsion three weeks thereafter. The other half were subsequently dipped once, and foot and head were bathed three times. Freshly attached ticks were invariably killed, but those which had been attached 4-5 days were unaffected. The cationic emulsion was superior to the anionic. Dipping apparently was ineffective against nymphs and larvae, but this seemed unimportant in practical usage of DDT in the effective control of the ticks. G. B. S. Heath, *Vet. J.* 102, 393-7.

INDUSTRY NEWS

Dr. Coleman is Named New NFA President

DR. Russell Coleman has been named president of the national Fertilizer Association, effective November 1st, the Association has announced. Dr. Coleman, presently

DR. RUSSELL COLEMAN

the director of Mississippi Agricultural Experiment Station, will succeed Maurice H. Lockwood who recently resigned to become vice president of the International Minerals & Chemical Corp., Chicago.

The NFA president-elect is a native of Mississippi, received his B.S. and M.S. degree at Mississippi State College, and his doctorate at the University of Wisconsin. He later became professor of soils at Mississippi State College, and associate director of the station. Under his management the station has taken notable strides through the enlargement of its facilities.

Dr. Coleman has been deeply interested in research work in connection with the fertilization of commonly grown crops and in scientific studies covering soil reaction. He has also made special investigations of phosphorous as a primary plant food.

He is a member of the American Society of Agronomy, the Soil Science Society of America, the American Association for the Advancement of Science, and numerous honorary societies in scientific and professional fields.

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Pest Control Group Meets

The National Pest Control Association plans to hold its 16th annual convention at the Royal York Hotel, Toronto, Canada, on October 18, 19 and 20. The meeting will place emphasis on the management phase of the business, with various panel discussions of technological, managerial and legislative subjects taking the spotlight. An equipment demonstration was also on the program.

Speakers on the advance program included Dr. F. C. Bishopp, assistant chief, Bureau of Entomology and Plant Quarantine, USDA; Dr. L. S. Henderson of the division of Insects Affecting Man and Animals; Dr. Bruce H. Douglas, Health Commissioner of Detroit; Dr. Gordon D. Jackson, Toronto medical officer; and Dr. James C. Munch, Munch Laboratories, Upper Darby, Pa.

Meetings

Western Canadian Weed Control Conference, 2nd Annual Meeting, November 3, 4 and 5, Winnipeg, Manitoba.

New York State Insecticide & Fungicide Conference, November 11, 12, Cornell Univ., Ithaca, N. Y.

National Fertilizer Ass'n., Fall Convention, November 15, 16 & 17, Atlanta Biltmore Hotel, Atlanta, Ga.

82nd Annual Kansas State Horticultural Society Meeting, December 2 & 3, Kansas City, Kan.

American Phytopathological Society, December 6, 7 & 8, Wm. Penn Hotel, Pittsburgh, Pa.

North Central Weed Control Conference, December 8, 9 and 10, Abraham Lincoln Hotel, Springfield, Illinois.

Amer. Ass'n. Economic Entomologists, New Yorker Hotel, New York, December 13-16, 1948.

Northeastern Weed Control Conference, Jan. 5-7, New Yorker Hotel, New York.

National Canners Association (and Canning Machinery and Supplies Association) January 14-21, Atlantic City, N. J.

Western Weed Control Conference, February 3 & 4, Bozeman, Montana.

South Dakota State Weed & Livestock Pest Control Conference, March 15 & 16, Aberdeen, S. Dakota.

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Lowell Names Hauser

Lowell Manufacturing Co., Chicago, has announced the appoint-

PHILLIP L. HAUSER

ment of Phillip L. Hauser as general sales manager. Mr. Hauser was formerly assistant sales manager of P & F Corbin Co., New Britain, Conn. before joining Lowell a year ago. He has had extensive experience in merchandising and selling through the hardware and farm supply fields, principal markets served by Lowell, makers of a complete line of agricultural sprayers and dusters.

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W. H. Gordon Dies

W. H. Gordon, a director of the National Fertilizer Association and manager of Chamberlin & Barclay, Inc., fertilizer manufacturers Cranbury, N.J., died on September 1. He was a member of the N.J. Potato Industry committee, and had spent his entire life in Cranbury.

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Declares Dividend

Lion Oil Co., El Dorado, Arkansas, has declared a regular quarterly dividend of 75c. per share on the common stock, which was to be paid October 15.

Aikman, E. P.
General Chemical Division,
Allied Chemical & Dye Corporation
Aitchison, A. G.
Westvaco Chemical Corporation
Alampi, Phil, WJZ Farm Director
Allen, R. F., American Cyanamid Co.
Allen, W.W., Dow Chemical Co.
Anderson, M. L.
Virginia Smelting Company
Andrews, W. R. E.
W. R. E. Andrews Sales Co.
Annand, Dr. P. N.
Bureau of Entomology & Plant Quarantine
U.S. Department of Agriculture
Auchincloss ,W. S.
Schnell Publishing Co.

Badertscher, A. E.
McCormick & Company, Inc.
Bales, I. W.
Chipman Chemical Company, Inc.
Ballman, D. K., Dow Chemical Co.
Barthel, W. F.
Innis, Speiden & Co.
Beatie, R. H.
Westvaco Chemical Corporation
Bennett, D. G.
Phelps-Dodge Refining Corporation
Bennett, J. C.
American Cyanamid Company
Bennett, W. C.
Phelps-Dodge Refining Corporation
Besthoff, S., Faesy & Besthoff, Inc.
Bishop, V., Central Chemical Corp.
Bissinger, W. E.
Pittsburgh Plate Glass Company
Columbia Chemical Division
Bittenbender, W. A.
Merck & Co., Inc.
Bixby, A. F.
Pennsylvania Salt Manufacturing Co.
Boyd, J. H.
Commercial Chemical Company
Brasfield, T. W., U.S. Rubber Co.
Brian, C. E.
California Spray-Chemical Corporation
Brunton, J. G.
Pennsylvania Salt Manufacturing Co.
Buchholz, J. H.
Cooperative Seed & Farm Supply Service
Bull, R. G., Sherwin-Williams Co.
Bunnell, M. J.
Geigy Company, Inc.
Bussart, J. E. Velsicol Corporation
Butler, E.
"Progressive Farmer"
Byrnes, R. F.
Rohm & Haas Company

Cameron, L. W.
Miller Chemical & Fertilizer Corporation
Campbell, C.
Pittsburgh Agricultural Chemical Co.
Camson, E. J.
Orbis Products Corporation
Cary, J. B., Food Machinery Corp.
Casey, E., U.S. Rubber Co.
Cavanagh, J. A.
The Dow Chemical Company
Chipman, R. N.
General Chemical Division.
Allied Chemical & Dye Corporation
Clark, R. A.
J. T. Baker Chemical Co.
Coe, J. P., U.S. Rubber Co.

Coey, J. S.
Hooker Electro-Chemical Company
Compton, C. C.
Julius Hyman & Company
Cory, H. V.
American Cyanamid Company
Cowan, E. K.
Standard Agricultural Chemicals, Inc.
Crego, M. H.
Phelps-Dodge Refining Corporation
Crissey, J. C.
Cooperative GLF Soil Building Service
Culpepper, W. P.
American Cyanamid Company
Curll, D. B., Commercial Solvents Corp.

Darley, M. M.
General Chemical Division,
Allied Chemical & Dye Corporation
Davis, C. W.
E. I. duPont de Nemours & Company, Inc.
DeRiemer, W. B.
E. I. duPont de Nemours & Company, Inc.
Doggett, S. H.
Doggett-Pfeil Company
Doordon, J. E.
Newton Chemical & Supply Company
Dorland, W. E., Agricultural Chemicals
Dorman, R.
California Spray-Chemical Corporation
Dove, W. E.
U.S. Industrial Chemicals, Inc.

Evans, L. J.
American Cyanamid Company
Evans, W. D.
American Cyanamid Company
Farrell, F. D., Taylor Chemical Co.
Ferguson, G. R.
Geigy Company, Inc.
Feuchter, H. W.
J. T. Baker Chemical Co.
Fisher, C. D.
Carbide & Carbon Chemicals Corporation
Fisher, H. C.
The Michigan Fertilizer Company
Flower, S. A., AIF Association
Fodor, P. A.
Pittsburgh Plate Glass Company
Columbia Chemical Division
Francis, W. J. F.
Pennsylvania Salt Mfg. Company
Freeborn, S. B., Univ. of California.

Gaarder, D. S.
The Sherwin-Williams Co.
Gaunt, E. A.
Cooperative G. L. F.
Soil Building Service, Inc.
Gemmell, L. G.
American Cyanamid Company
Georgi, E. A.
United Co-Operatives, Inc.
Gerdes, E. C., Geigy Company, Inc.
Gibbs, C. M., Merck & Co., Inc.
Gleissner, B. D.
American Cyanamid Company
Goldberg, M., Geigy Co., Inc.
Gopp, L. W., Michigan Chemical Corp.
Gowen, H.
Howerton Gowen & Company
Grady, H. J.
California Spray-Chemical Corporation
Griffin, E. L.
U.S. Department of Agriculture
Griffin, R. H., Geigy Company, Inc.

Griffith, A. E.
Socony-Vacuum Oil Company, Inc.

Haas, C. Y. Attapulgus Clay Co.
Hall, J. N.
Julius Hyman & Company
Hall, W. F.
Chipman Chemical Company, Inc.
Hamilton, H. W.
National Association of Insecticide & Disinfectant Manufacturers
Hanemann, H. A.
Pennsylvania Farm Bureau Cooperative
Hansen, R. F.
General Chemical Division,
Allied Chemical & Dye Corp.
Harris, C. S., Shell Oil Co., Inc.
Harry, J. B.
Carbide & Carbon Chemicals Corporation
Hart, E.
Niagara Chemical Division
Food Machinery Corporation
Hartley, R. O., Velsicol Corp.
Hartz, G., Orbis Products Corp.
Hartzell, A., Boyce Thompson Institute
Haschke, T. A.
Stauffer Chemical Company
Hastings, J. G.
Canadian Industries, Ltd.
Haude, W. J.
Pittsburgh Agricultural Chemical Co.
Heagy, A. B.
Association of Economic Poisons Control Officials
Heal, R. E., Merck & Co., Inc.
Hile, J. R.
Acme White Lead & Color Works
Hitchner, L. S., AIF Association
Hoeffler, J. H.
American Cyanamid Company
Horsfall, J. L.
American Cyanamid Company
Howell, J. A.
Tobacco By-Products & Chemical Corp.

Ingram, M. J.
Cooperative GLF Soil Building Service

James, W. S.
Central Chemical Corporation
Jarrett, E. L.
Geigy Company, Inc.
Johnson, C. C.
Innis, Sneiden & Co.
Jones, H.
U.S. Industrial Chemicals, Inc.
Jones, J. P., Stauffer Chemical Company

Karr, E. H.
Pennsylvania Salt Manufacturing Co.
Kary, Dr. R. M.
American Smelting & Refining Company
Kennedy, J. H.
Stauffer Chemical Company
L. W. Kephart
United States Department of Agriculture
Klock, F. Y.
Crop-Saver Chemical Company, Inc.
Krieger, G. C., Ethyl Corporation

LaForge, B. F.
S. B. Penick & Company
Lamb, G., Kittelle & Lamb
Langhorst, H. J.
American Cyanamid Company
Leonard, G. F.
Tobacco By-Products & Chemical Corp.
Leonard, M. D.
Julius Hyman & Company
Lerch, D. G.
Columbia Broadcasting System
Link, R. P.
College of Veterinary Medicine,
University of Illinois
Long, H. F.
Miller Chemical & Fertilizer Corp.
Long, J. D.
Bureau of Plant Industry, Soils & Agric Eng., U.S. Department of Agriculture

Long, J.
Tobacco By-Products & Chemical Corp.
Long, L. A., Agricultural Chemicals
Long, W. N.
Miller Chemical & Fertilizer Corporation
Lynch, D., Velsicol Corporation
Lynch, J. J.
Niagara Chemical Division,
Food Machinery Corporation
MacNair, I.
Agricultural Chemicals
C. H. Mahoney
National Canners Association
Manker, B. C.
The Michigan Fertilizer Company
Mansfield, H. P.
E. I. duPont de Nemours & Company, Inc.
Marshall, C. V.
Department of Agriculture, Ottawa, Canada
Marshall, S.
Central Chemical Corporation
Matthews, L. G.
American Smelting & Refining Company
Maughan, F. B.
Rohm & Haas Company
Mayfield, P.
Hercules Powder Company, Incorporated
McCallan, S. E. A.
Boyce Thompson Institute
McClintic, E. C., Pure Carbonics, Inc.
McConnon, I., McConnon & Company
McCormack, T. H.
E. I. duPont de Nemours & Company Inc.
McDowell, T. J., Sherwin-Williams Co.
McManus, P. J.
Cooperative GLF Soil Building Service
Meister, E. G. K.
American Fruit Grower
W. F. Meyer, F. F. Drew & Company
Merritt, J. M.
Tobacco By-Products & Chemical Corp.
Merritt, W. E.
Ashcraft Wilkinson Company
Miller, J. V., Atlas Powder Company
Missbach, G.
Velsicol Corporation
Mohr, A. W.
California Spray-Chemical Corporation
Moreland, W. S., AIF Ass'n.
Morgan, H.
The Michigan Fertilizer Company
Morgan, T., Agricultural Chemicals
Moyer, W. H.
Chipman Chemical Company, Inc.
Murphy, D. F.
Rohm & Haas Company
Murphy, D. J.,Monsanto Chemical Co.

Nesbitt, C. M.
American Cyanamid Company
Neuberg, L.
Westvaco Chemical Corporation
Newton, W. F.
Columbia Chemical Division
Pittsburgh Plate Glass Company
Nikitin, A. A.
Tennessee Corporation
Noble, H.
S. B. Penick & Company
Noone, J. A.
Pennsylvania Salt Manufacturing Co.

O'Dea, J.
Shell Oil Company, Inc.
Oehm, G. M.
E. I. duPont de Nemours & Company, Inc.
Ott, E. M.
Pennsylvania Salt Manufacturing Co.

Parker, R. T.
Geigy Company, Inc.
Perinchief, M. K.
Scientific Soil Products, Inc.
Peter, K., American Cyanamid Company
Peterson, P. D.
Stauffer Chemical Company
Pfeil, A. S., Doggett-Pfeil Company
Phillips, E. H.
Cooperative GLF Soil Building Service, Inc.
Porter, F. B.
Tennessee Corporation
Powell, J.
John Powell & Co., Inc.
Preston, S. D.
American Cyanamid Company
Price, W. F.
Swift & Company
Rapp, F. U.
Hercules Powder Company, Incorporated
Rappe, E. H.
Swift & Company
Rarig, F. J.
Rohm & Haas Company
Reed, Dr. T. W.
California Spray-Chemical Corporation
Riches, G.
Riches Nelson Company
Reideburg, T.
McLaughlin Gormley King Co.
Rinke, G. R.
John Powell & Co., Inc.
Robison, J. G.
Pennsylvania Salt Manufacturing Co.
Rodda, J. A.
U. S. Industrial Chemicals, Inc.
Rohwer, S. A.
Bureau of Entomology & Plant Quarantine
U. S. Department of Agriculture
Rowe, W. M.
Flag Sulphur & Chemical Company

Sanders, J. G.
Commercial Solvents Corp.
Setterstrom, C. A.
Carbide & Carbon Chemicals Corporation.
Shafer, J. I.
B. G. Pratt Company
Shanaman, F. C.
Pennsylvania Salt Manufacturing Co.
Shattuck, H. F.
Monsanto Chemical Company
Siddall, C.
Pennsylvania Salt Manufacturing Co.
Singmaster, J. A.
Monsanto Chemical Company
Skaptason, J. B.
Pittsburgh Agricultural Chemical Co.
Small, W. A.
Canadian Industries, Ltd.
Smethurst, R.
National Association of Manufacturers.
Smith, C. F.
North Carolina State College
Smith, C. L.
Agricultural Insecticide & Fungicide Assn.
Smith, J. M. The Sherwin-Williams Co.
Smith, T.L.
Miller Chemical & Fertilizer Corporation
Smith, W. A.
Schnell Publishing Co.
Somerville, M. L.
The Sherwin-Williams Co.
Sparre, F. D.
E. I duPont de Nemours & Company, Inc.
Starr, D. F.
S. B. Penick & Company
Stenerson, H.
Chemical and Engineering News
Stoddard, J.
John Powell & Co., Inc.
Stoddard, R. B.
U.S. Industrial Chemicals, Inc.
Stoneleigh, D. R.
United States Rubber Company
Straube, H. L.
John Powell & Co., Inc.
Sunderland, W. W.
The Dow Chemical Company
K. J. Sutherell
The Sherwin-Williams Co.
Swab, H.
Atlas Powder Company

Tandy, C. H.
Port Fertilizer & Chemical Co.
Taylor, J. M.
Taylor Chemical Company
Taylor, W. M.
Niagara Chemical Division,
Food Machinery Corporation
Thom, J. C.
Westvaco Chemical Corporation
Thomas, E. L.
Swift & Company
Thompson, F.
R. J. Prentiss & Co., Inc.
Torpin, P. D.
McLaughlin Gormley King Co.
Traylor, W. L.
Stauffer Chemical Company
Tribble, J. H.
Taylor Chemical Comany
Turner, M. B.
U. S. Industrial Chemicals, Inc.

Utter, L. G.
Phelps-Dodge Refining Corporation

Van Allen, J. R.
Cooperative GLF Soil Building Service, Inc.
Van Geluwe, J.
Cooperative GLF Soil Building Service, Inc.
Van Winkle, D. C.
Julius Hyman & Company
Vernon, J. V.
Niagara Chemical Division,
Food Machinery Corporation
H. C. Vogler
Day & Zimmerman, Inc.
Volk, T. V.
E. I. duPont de Nemours & Company, Inc.

Walcott, R. H.
Stauffer Chemical Company
Washburn, F. S.
American Cyanamid Company
Webster, B. P.
Chipman Chemical Company, Inc.
Weed, A.
John Powell & Co., Inc.
Welch, C. L.
National Cotton Council of America
C. W. Whittaker
United States Department of Agriculture
Wilken, R. E.
Hooker Electro-Chemical Company
Wilkerson, T. L.
American Cyanamid Company
Williamson, G. R.
Agricultural Sulphur & Chemical Co.
Willis, P. S.
Grocery Manufacturers of America, Inc.
Wilson, R. L.
Michigan Chemical Corporation
O. T. Wingo
J. T. Baker Chemical Company
Winship, C. H.
Phelps-Dodge Refining Corporation
Wood, H. J.
Tobacco By-Products & Chemical Corporation
Woodbury, E. N.
Hercules Powder Company, Incorporated
Woods, F. J.
General Chemical Division,
Allied Chemical & Dye Corporation
Wotherspoon, R.
Orbis Products Corporation

Yates, R. T.
Hercules Powder Company, Incorporated
Young, A. E.
Cooperative Seed & Farm Supply Service, Inc.

Zabor, J. W.
Pittsburgh Agricultural Chemical Co.
Zipse, R. J.
Geigy Company, Inc.

Virginia-Carolina Chemical Co. in New Home

Virginia-Carolina Chemical Corporation has announced the removal of its administrative offices to its new home office building (above), 401 E. Main Street, Richmond 7, Va. The move was completed on September 13th. The company produces phosphate rock, agricultural chemicals including insecticides and plant foods, cotton and burlap bags, and a line of industrial cleansers. The company has designated October 15 as "Open House" for invited guests.

Control Officials Meet

Two important meetings were scheduled to be held in the Shoreham Hotel, Washington, D. C. on October 9 and 10. The Association of Economic Poisons Control Officials planned to hold a one-day meeting on Saturday, October 9, and the Association of American Fertilizer Control Officials on Sunday, October 10.

The A.E.P.C.O. meeting will mark its second annual gathering, the first having been held in Washington last year, with officials from 28 states in attendance. Officers of the A.E.P.C.O. are Dr. J. L. St. John, chairman of the Division of Chemistry and State Chemist, Pullman Washington, president; H. J. Hoffmann, chief chemist, Minnesota State Dept. of Agriculture, Dairy & Food., St. Paul, vice-president; and Dr. A. B. Heagy, chemist, Maryland Inspection Service, College Park, Md., secretary-treasurer.

In its one-day session, the A.A.F.C.O. has planned a complete program dealing with late problems facing the fertilizer industry. Members of the industry were extended a hearty welcome, according to Henry R. Walls, College Park, Md., secretary-treasurer of the organization. Other officers of the group are Allen B. Lemmon, chief, California Bureau of Chemistry, president and Dr. B D. Cloaninger, Clemson, S.C., vice president.

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AOAC Meets in October

The Association of Official Agricultural Chemists, Inc., has announced that its 62nd annual meeting would be held at the Shoreham Hotel, Washington, D.C., October 11-13. Included on the advance program for Monday, October 11, was a session on economic poisons, under the chairmanship of Dr. J. J. T. Graham, U.S. Department of Agriculture. Subjects were to include Rodenticides, by J. W. Elmore; DDT, by E. E. Fleck; Tetraethyl Pyrophosphate, by S. A. Hall; Herbicides, by A. B. Heagy; Insecticides Containing Derris and Cube by F. A. Spurr; Oil Emulsions, by L. Keirstead; and a general referee's report by J. J. T. Graham.

A session on fertilizers was scheduled for Monday morning, under the chairmanship of F. W. Quackenbush. Sampling was to be discussed by H. R. Allen; phosphoric acid by W. L. Hill, J. O. Hardesty and Colin W. Whittaker; nitrogen by M. P. Etheridge; potash by O. W. Ford; and the general referee's report by Mr. Quackenbush. Contributed papers were scheduled to be presented by H. K. White, O. W. Ford and S. R. Miles.

Fertilizer Imports Up

Exports of fertilizers and fertilizer materials during the fiscal year ended June 30, 1948 were 9,000 tons short of the amount exported during the corresponding period of the previous year, according to figures compiled by the National Fertilizer Association. The past year's exports totaled 2,144,000 short tons as compared to the record 2,153,000 short tons reported for the 1946-47 fiscal year.

Shipments of nitrogenous materials amounted to 532,000 tons, comprising 25 percent of all exports. These shipments were 35 percent greater than those of the preceding fiscal year. Shipments of phosphate materials, however, were ten percent below the 1946-47 totals, but even so they comprised 67 percent of all exports.

During the past fiscal year while exports showed a slight decrease, imports to the U.S. were 24 percent above those reported for the 46-47 fiscal year. Total imports of fertilizers and fertilizer materials were 1,482,000 short tons (valued at $58,625,000) for the 47-48 period, compared to 1,193,000 tons imported during the previous year.

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Advancement for Gerlach

Charles F. Gerlach has been appointed technical service manager, agricultural chemicals dept. at Michigan Chemical Corporation, Saint Louis, Michigan according to an announcement by Robert L. Wilson, general sales manager. In his new capacity Mr. Gerlach will coordinate the various technical activities related to the company's insecticides, fungicides and weed killers. Besides chemical and entomological research at St. Louis, the firm has a number of sponsored projects with various research organizations and agricultural colleges.

Mr. Gerlach joined the Michigan Chemical staff in May 1946 as chief entomologist. For the past two years he has had charge of field experiments and has travelled extensively in the United States, also participating in cooperative insecticide tests in Mexico and Guatemala. During his military service he was assigned to the U.S. Public Health Service at Springfield, Illinois. He is an entomology graduate of the University of Wisconsin.

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Chulski to H. Hanson Co.

Karl Chulski has been appointed to the Agricultural Chemical Research Department of Howard Hanson & Co., Beloit, Wisconsin. Mr. Chulski, an agronomist, is a graduate of Michigan State College. He will direct the company's research projects on the effect and results of insecticides, weed killers and residuals in soils, as well as continuing experiments to improve the company's products. The firm manufactures chemicals and equipment for agricultural use.

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N. E. Weed Conf. for Jan.

The Northeastern Weed Control Conference will be held at the New Yorker Hotel, New York, January 5, 6 and 7, according to Dr. Robert D. Sweet, Cornell University, who is secretary of the Conference.

Details of the program are being worked out by Dr. Benjamin Wolf, Seabrook Farms, Bridgeton, N. J., who states that those who wish to present papers at the conference should have their titles in his hands by November 1.

The Conference will have available for the first time, display booths for commercial exhibits to show developments in the agricultural chemical field.

Chairman of the Northeastern Conference is Dr. Gilbert Ahlgren, head of the Agronomy Department of Rutgers University. The Conference was formed three years ago, and last year's meeting in New York attracted more than 300 representatives of the agricultural chemical industry and research workers from colleges in the 13 northeastern states.

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Dr. C. B. Smith Dies

Dr. Clarence B. Smith, retired U.S. Department of Agriculture official, died September 18, at his home in Takoma Park, Md. He was 78. Dr. Smith was assistant director of the U.S.D.A extension service upon his retirement, October 31, 1938. He had previously been chief of the department's office of Cooperative Extension Service and editor of the Experiment Station Record. He received three degrees from Michigan State College, East Lansing.

Aside from his work with the Department, he was well known as co-author of a number of Cyclopedia for agriculture, covering both the broad aspect of the subject, and specific branches.

•

Dorsey Retires at Illinois

Dr. Maxwell J. Dorsey has retired as the head of the department of Horticulture at the University of Illinois after twenty-three years of service. The retirement became effective on September 1. Dr. Dorsey is a native of Ohio, and a graduate of Michigan State College and of Cornell University. He was succeeded by Dr. B. L. Wade, formerly director of the U.S. Regional Vegetable Breeding Laboratory.

A "weedspray weekend" was recently designated by the residents of Springfield, Pa. who went all-out to kill poison ivy and other weeds from the parks, playgrounds and schoolyards of the community. The American Chemical Paint Co., Ambler, Pa. furnished quantities of its 2,4-D product, "Weedone" for the project.

Above is a group of townspeople spraying the edges of the high school athletic field. Poison ivy, long a civic problem, was largely killed out through this program.

Davey Tree Expert Co. Honors Employees of Long Service

The thirteen empoyees of the Davey Tree Expert Co., Kent, Ohio, pictured here represent a total of some 500 years of service with the organization; each having completed at least 35 years with the company. In the front row, left to right, are: Harmon L. Carson, manager of the warehouse at Kent, with Davey since 1908; Walter E. Bailey, Florida Supervisor, 1909; Perry E. Hudson, Long Island sales representative, 1909; and Charles A. Stutzman, Boston foreman, 1909.

Standing, left to right, are: Mrs. Irene George, payroll dept., 1910; E. P. Metcalfe, Chicago field supervisor, 1910; Walter H. Wilhelm, White Plains, N. Y. foreman, 1910; George Cotton, New Jersey foreman, 1911; C. H. Blissler, field supervisor for New England, Long Island and Westchester county, N. Y., 1912; Felix H. Caldwell, Cincinnati, foreman, 1911; Pete Gammie, Stamford, Conn. foreman, 1912; Harry A. Strevell, Long Island foreman, 1911; Sarah M. Deubner, supervisor of office services, 1913.

Unable to be present when the photo was taken were D. Grove, chief field supervisor, who joined the company in 1910; and Paul H. Davey, vice-president, who began with Davey as a fieldman in 1911.

Penn State Weed Control Conference Attracts Group of 1,000

THE first weed control conference ever held at Pennsylvania State College drew a group of 1,000 on September 9. Speakers representing the Pennsylvania State Agricultural Experiment Station and the U. S. Department of Agriculture discussed chemical means of controlling unwanted plants.

Dr. Stephen Raleigh, chairman of the Penn. state weed control research committee advised his hearers not to throw away the cultivator as yet, pointing out that there is still much to be learned about the use of chemical herbicides. He reviewed some of the experimental work conducted on 1,800 plots this season.

Ten formulations of 2,4-D tried in various concentrations were described, as well as calcium cyanamid for field crops, and other chemicals in both pre and post-emergence treatments. In addition to 2,4-D, other preparations tested included IPC, "Ammate," sodium thiocyanate, ammonium trichloro-arsenate, "STA" and sodium acetate; most of them to curb quackgrass.

Prof. C. J. Noll of Pennsylvania State College reviewed similar tests conducted with asparagus, lima beans, spinach, string beans, beets and sweet corn. George Berggren, extension agronomist, then listed cautions and recommendations from observations made throughout the state in 1948. He reported that some 60,000 acres of corn were sprayed with 2,4-D.

Dr. L. W. Kephart, in charge of weed control for the USDA, pointed out some of the problems in connection with determining "which chemicals work on what plants." He said that over 3,000 plants are considered as harmful weeds, and nearly 60 chemical preparations are now under test to control them. He urged an educational program so farmers may be able to identify better the plants they wish to control, then to use the proper material for this purpose. Dr. Kephart emphasized that there is no single chemical cure-all to replace efficient cultivation.

Presiding at the meeting was Dr. Michael A. Farrell, acting director of the Experiment Station. The sessions, originally scheduled to be held out-of-doors, were forced inside by rain. Despite the adverse weather, however, visitors were transported over the college farms to see experimental plots of carrots, corn, potatoes and other crops as well as fencerows on which chemical herbicides had been used. Research workers in charge of each test were on hand to explain details of the newer weed control methods employed.

Manufacturers of various chemical weed killers and of application equipment had exhibits.

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NFA Meeting Next Month

An address by Dr. Russell Coleman, newly-elected president of the National Fertilizer Association, will be one of the features of the group's fall meeting scheduled for November 15, 16 and 17 at the Biltmore Hotel, Atlanta, Ga.

The first day of the meeting will be devoted to a meeting of the NFA board of directors, and the following two days to general sessions. Speakers on Tuesday and Wednesday, in addition to President Coleman, include Gordon Clapp, chairman of the board, Tennessee Valley Authority, Knoxville, Tenn.; Dr. Firman E. Bear, chairman, soils department, New Jersey Experiment Station, New Brunswick, N. J.; F. H. Leavitt, technologist, agricultural department, Shell Chemical Corp., San Francisco; Dr. C. C. Murray, director, Georgia Agricultural Experiment Station, Experiment, Ga.; and Ray L. King, chairman of the NFA board of directors. The annual dinner will be held on the evening of Tuesday, November 16, with C. T. Prindeville, vice chairman of the NFA board of directors, toastmaster.

Below: Some of the exhibits put on display by herbicide suppliers, and the Pa. State Agricultural Experiment Station. The upper center is a display of various weeds classified by their susceptibility to 2,4-D.

Feed Officials Meet

The Association of American Feed Control Officials, Inc. have announced plans for their 38th Annual Convention at the Shoreham Hotel, Washington, D.C., October 14 and 15.

Officers of the A.A.F.C.O. are William L. Hunter, Sacramento, Calif., president; A. M. G. Soule, Augusta, Maine, vice-president; and L. E. Bopst, College Park, Md., secretary-treasurer.

J. D. Long to U.S.D.A

J. Dewey Long, was appointed to the U.S.D.A. staff of agricultural engineers on September 3, in a move to strengthen further the department's research in this field, according to P. V. Cardon, agricultural research administrator.

Mr. Long has just returned from an assignment with a mission from the Office of Foreign Agricultural Relations to Bogota, Colombia. For many years previously, he was engaged in similar work, being on the staff of the division of agricultural engineering of the University of California from 1922 until 1940. At that time he joined the Douglas Fir Plywood Association at Tacoma, Washington.

•

Zabor to Pittsburgh Co.

Dr. J. W. Zabor is now with the Pittsburgh Agricultural Chemical Co., Empire State Building, New York, where he is carrying on development and research. Before coming to the Agricultural Chemical division, Dr. Zabor was director of research of the Activated Carbon Division of the parent organization, Pittsburgh Coke & Chemical Co., Pittsburgh.

DR. J. W. ZABOR

He holds degrees from Hiram college, Ohio; Brown University, and the University of Rochester from which he received his Ph.D.

•

J. E. Lee to MGK Co.

McLaughlin Gormley King Co., Minneapolis, Minn. has announced the appointment of Joseph E. Lee as Central States Sales representative. He will be stationed in the Chicago area, with headquarters at his residence, 805 Reba Place, Evanston, Ill.

•

New Control Operator

Neveu's Insect Control Service opened for business September 2, at Lafayette, Louisiana. The new firm will operate both in the town and surrounding rural areas.

NY Conference Scheduled

The tenth annual New York State Insecticide and Fungicide Conference will be held at Bibbins Hall, Ithaca, N. Y., November 11 and 12, 1948. A program consisting of technical papers and progress reports by representatives of the N. Y. Agricultural Experiment Station and of industry is being worked out by the committee which is composed of Drs. L. M. Massey, Charles E. Palm and O. C. French.

In connection with the meeting, a conference will be held on the afternoon of November 10, to discuss the program of research and development in the field of application equipment for insecticides and fungicides.

LISTENING POST

(*Continued from Page 49*)

ally in other districts from which reports were received. The potato leaf-hopper occurred in abundant numbers on beans in New Jersey and Virginia throughout most of the period. A serious infestation of the bean aphid was reported damaging several acres of beans in Ventura County, California shortly after the middle of August. Other pests reported damaging beans during the period included the bean leaf roller in South Carolina and Florida; the bean looper in New Jersey and California; the fall armyworm in southern New Jersey; the corn earworm in New Jersey, Virginia, and California; and the two-spotted spider mite in Virginia, southern Utah, and southern California.

Infestations of cabbage caterpillars were moderate to heavy during late August or early September in parts of New Jersey, Georgia, Florida, Alabama, Ohio, Wisconsin, and Idaho. Lighter populations were reported from New York, Virginia, South Carolina, Tennessee, Utah, and southern California. Aphid populations on cabbage were reported as moderate to heavy in New Jersey, Virginia, and California, lighter infestations being present in New York, South Carolina, Georgia, Wisconsin, and Washington. The harlequin bug was present in moderate to heavy numbers on crucifiers in Maryland, South Carolina, Georgia, Florida, Mississippi, and Tennessee. Other insects reported to be damaging crucifers during the period included the striped flea beetle, armyworms, grasshoppers, thrips, mole crickets, and cucumber beetles.

The melonworm and pickleworm were causing damage during late August or early September in parts of Maryland, Virginia, South Carolina, Georgia, Mississippi, Tennessee, and Louisiana. Toward the middle of September cucumber beetles were reported serious in Georgia and numerous in Wisconsin. These beetles had been present in destructive numbers over a wide area in late August, including New Jersey, New York, Virginia, South Carolina, Florida, Mississippi, Tennessee, and Wisconsin.

Severe infestations of hornworms were present on tomatoes in New Jersey, South Carolina, Texas, and Ohio toward the middle of September. They were reported causing serious damage to that crop in parts

of New York and Virginia during the latter part of August.

Aphid populations on potatoes in Maine continued to increase during the last half of August. The peak was reached about the first of September and populations were on the decrease soon thereafter. Aphids were increasing slightly on potatoes in central Washington toward the end of August. Heavy infestations of the potato aphid occurred on tomato in Ohio at that time, and in early September severe aphid infestations were present in some tomato fields in New York. Also, in early September, aphids were damaging lettuce grown for seed and sugar beets in southern Idaho, while moderate to heavy numbers of these pests occurred on melons in New York. Toward the middle of September aphid infestations were light on various vegetables in Florida, but severe on cucurbits in Texas.

During the last half of August aphids were increasing on tobacco in northwestern Tennessee and were causing moderate to heavy injury.★★

AIFA SIDELIGHTS

(*Continued from Page* 31)

a desert airport at full speed, careening on a mile or so beyond the end of the runway before coming to a sandy stop.

The worst situation on the entire trip, however, was the case of the missing case . . . a travelling bag containing photographic equipment, which pursued Dr. Kephart all over the continent, always arriving just a day or so behind him. At last, only a couple of days or so before his returning to the U.S., the much-traveled grip caught up with him. By then the most important opportunities for picture-taking were gone. He did get some photos of scenes enroute home, however.

* * * * *

The feminine contingent on the beach was organized around a dependable nucleus consisting of Mrs. Ernie Hart, Mrs. George Riches, Mrs. Byron Webster and Mrs. Jack Vernon who incidentally, sported the best tan. The male member of the Webster clan, assisted by your reporter, functioned as private life guards and censors of feminine beach attire.

* * * * *

"Grub" Leonard and Mrs. Leonard were host and hostess at an impromptu cocktail party in their presidential suite on Monday evening, welcoming early arrivals by pouring cocktails which featured that well known Kentucky beverage, bourbon.

* * * * *

Calling all men! Calling Mercer Rowe and Dick Yates! Hurry to Hotel Monterey. That is all!

* * * * *

Two visiting radio editors, Phil Alampi, Farm Director of Station WJZ, New York, and Don Lerch, of the Columbia Network, Washington, were at the meeting with their wives. When the four were bathing in the Atlantic, one wag showed surprise that these radio people should be interested in any wave other than air waves. (Ed. Note: Ouch!) . . . A considerable amount of radio time had been devoted to AIF activities, including a spicy interview between Phil Alampi and Stanley A. Flower, AIF Public Relations Director, on WJZ Sept. 14.

* * * * *

A puzzled lad was Joe Noone of Pennsylvania Salt when golf prizes were awarded at the banquet. He was called up to receive an award for excellent golf whereas actually he hadn't been near the golf course! But Joe kept a straight face, and accepted graciously. Ed. Note: Real white of Joe, wasn't it?)

* * * * *

S. A. Rohwer put the industry straight on his status at the meeting, by stating that he *had* received an honorary degree of "Doctor of Science" from the University of Colorado during the summer. but that he still preferred to be called "Mr. Rohwer," or by some of the less formal names by which he is known. (Ed. Note: In public Red?) Most widely used for obvious reasons among these is "Red." Anyway, the congratulations of the industry are extended to "Red" Rohwer.

* * * * *

The palm for the largest delegation goes to American Cyanamid, represented by J. L. Horsfall, H. J. Langhorst, F. S. Washburn R. F. Allen, J. C. Bennett, L.

G. Gemmell, B. D. Gleissner, J. H. Heffler, C. M. Nesbitt, K. Peter, S. D. Preston, and T. L. Wilkerson.

* * * * *

Ed Littooy, Colloidal Products, made the long trip east again,— all the way from San Francisco, further swelling the west coast delegation.

* * * * *

Bill Andrews of W. R. E. Andrews Sales, and Mrs. Andrews, had their charming sixteen year old daughter, Patricia, along with them. Give her two more years and she'll be the belle of the convention. A red head, incidentally!

* * * * *

Added second generation note,— John Powell was chaperoned by his 16 year old son, David. The latter is a better golfer than his old man will ever be. But will he ever be as good at incorporating rubber boots in pyrethrum?

* * * * *

Meet the new directors: Russ Stoddard of U.S.I., closely resembling a 2-quart bottle of milk in his white tuxedo, which Joe Cary insists are worn on the west coast only for formal morning funerals. Don S. Gaarder of S-W and T. H. McCormack, of du Pont complete the list of new board members.

* * * * *

Dave Lynch and the Velsicol tribe occupied the famous suite from which the Brunton high dive was performed last year. Dave had promised to take over the diver's role himself this year, plunging head first from the balcony into a glass of chlordane. He backed down at the last minute, pleading a severe case of sunburned dome.

* * * * *

Bill Haude and Doc Skaptason of Pittsburgh Ag joined your agent on a tour of the Spring Lake night spots one evening, catching the act of Maestro Adams, perennial violin entertainer at the Homestead. For the boys from Pittsburgh Ag, he played "Pittsburgh Rag."

* * * * *

Harold Noble of Penick, and Ted Reideberg, of MGK, Eddie Camson of Orbis, Carlos Kampmeier of R & H and Harold Feuchter of Baker were steady beach patrons. The swimming, by the way, was the best of the season, though just a few days before high seas had been spilling swimmers all over the beach, breaking arms and legs and filling the hospitals with accident cases.

AIFA MEETING

(*Continued from Page* 32)

such an operation might cause damage from drift.

As a matter of policy, however, the forum participants told the industry that insecticides are classified as being "inherently dangerous."

A review of events leading up to the recent Cement Institute Decision, and a discussion of its possible effect on the pesticide industry was presented by Ray Smethurst, general counsel of the National Association of Manufacturers. He

brought out that the decision, which condemns the basing point system of pricing, is actually a new interpretation of the old Robinson-Patman law. He pointed out that industry and business are not of one opinion regarding the basing point system, since some types of business stand to benefit from the new law, while others, of course, will be forced to sell at a decided disadvantage. It is difficult to get the public interested in industry's plight, he said, because the case is too complicated. Since the matter is so confused at the present time, his advice to the pesticide industry, was to "sit tight" until more information is available.

The session then adjourned for lunch, to reconvene in the afternoon for a discussion on the new insecticides. This meeting was for members only. The newly-elected Board of Directors met later as the final event of the 1948 meeting.★★

SOUTH vs PESTS

(*Continued from Page 24*)

to govern all situations under which 2,4-D might be used does not appear to be the best way to solve this problem. Rather than lay down ironclad rules, the better procedure would seem to be to provide some responsible state agricultural authority which would be allowed a considerable amount of leeway in deciding what procedure should be followed in treating a specified crop or area. In this way, in areas in which there were no crops susceptible to injury, the herbicide could be applied as dust.

With weed control a problem of so great importance throughout the South, no steps should be taken that will prevent growers from deriving the maximum benefit from 2,4-D and other herbicides. There is, however, a vital need for legislation governing the use of such materials. Every effort should be made to safeguard crops susceptible to injury without unduly restricting the proper use of herbicides, however.

In the years ahead, there is every reason to believe that Texas and other southern states will provide a profitable and growing market for chemical materials used in the production of crops and livestock. In Texas last year more farmers and ranchmen than ever before carried out insect control measures. In addition to the 31,930,000 pounds of poisons applied to cotton, 972,275 more pounds were used against animal parasites. And 1,669,851 lbs. were purchased for use on fruits and vegetables.

Over 2 million head of livestock were treated for fly and parasite control. Spraying was the most popular method of applying the insecticides—1,285,777 head were sprayed, 640,815 dipped and 146,084 dusted.

As farms and acre yields become larger with a much higher percentage of farm owners, there will be a more widespread appreciation of the value of insecticides, fungicides and herbicides in increasing yields and lowering production costs. Higher crop yields will give farmers a large enough investment in their crop to make it doubly important to protect

them. And the sounder all round farming program, by materially increasing farm income, will increase the farmer's ability to purchase such materials.

In recent years, southern farmers have made outstanding progress in increasing acre yields. From 171 lbs. per acre average for 1925-29, the yield has climbed to 242 lbs. for 1945-46, and a record of 315 lbs. is forecast for this year. This is an increase of 41.6 per cent as compared with a 32 percent increase for corn during the same period. More attention to soil building has been the most important fact in boosting acre yields of cotton.

A recently published discussion on insect needs and soil fertility by Leonard Haseman, Department of Entomology, University of Missouri, pointed out that while insects vary in their dietary requirements, generally speaking, soil depletion tends to results in production of stunted crops which are highly favorable as food for insects. It was suggested that farmers learn how to vary the formula of fertilizer so as to make the crop less satisfactory as food for insects and more nutritious for man.

The ratio between prices of farm products and insecticides, for example, is naturally much more favorable to the heavy use of insecticides when farm prices are high. Even at considerably higher prices, insecticides are a much better buy now than they were when cotton was bringing 10 cents a pound. No one expects farm prices to remain permanently on their present level. On the other hand, there are few who think the bottom is going to drop out to the extent it did in the early 30's. But regardless of what happens, southern farmers are fairly well prepared to meet it. For instance, the per cent increases of 1947 income, time deposits, bonds, and demand deposits over 1940 is nearly 300 per cent.

The farmer will be able to spend his savings for better farming and more enjoyable living. He will be able to do this because he has been getting out of debt. Back in 1932 the mortgage indebtedness of southern farmers was 137% of the cash income for that year. Each year this percentage has decreased until 1946, the last year for which we have figures, the mortgage indebtedness was only 18 per cent of the cash farm income.★★

UREA - FORM

(*Continued from Page 27*)

frequent additions be made to the nutrient solution. Trials have been made at the Plant Industry Station since 1945 to determine if untreated Florida pebble phosphate rock as well as defluorinated phosphate rock used as media in subirrigated nutriculture benches would provide sufficient phosphorous for satisfactory growth of various floricultural crops. These phosphate-containing materials were obtained from the Coronet Phosphate Company through Dr. K. D. Jacob, Division of Fertilizer and Agricultural Lime of this Bureau. Concrete bench sections 12 feet long, 57 inches wide, and 7 inches deep were filled

with these two materials, and other sections with washed pea gravel. The aggregates ranged from 1/16 to ½ inch in particle size. A complete nutrient solution, except that it contained no phosphorous, was pumped into the beds containing the phosphate media daily. Similar sections containing gravel received the same solution, and in addition 3.8, 7.7, 15.5 or 31 parts per million of phosphorous (as P) were added at 2-week intervals. The entire solutions were replaced monthly. The phosphorous content of each solution was determined photometrically by using the amino naphthol sulfonic acid and ammonium molybdate method, just before new additions of phosphorous were made or the solutions were replaced. These data show that the amount of phosphorous in the solution from the phosphate media was always less than 1 and usually less than 0.5 p.p.m. More phosphorous and considerably more calcium were released from the defluorinated product than from the untreated pebble. The pH of the solution from the former tended to rise above 7.0. Data showing the comparative growth of six varieties of chrysanthemums are presented in table 1.

These data show that the chrysanthemum plants were able to obtain sufficient phosphorous from the pebble medium to equal the growth of plants in gravel that received 300 liters of solution containing 15.5 p.p.m. of phosphorous at 2-week intervals. Growth of the plants in defluorinated rock was inferior to that in the untreated material. The same two materials have been used for the growth of snapdragons and Easter lilies with very satisfactory results.

Nitrogen Experiments

IN nutriculture tests nitrogen is the element absorbed by plants in largest quantities and is the one producing the greatest effect on growth. During rapid growth plants rapidly deplete the nitrogen content of the nutrient solution. The use of natural organic nitrogen materials that would liberate nitrogen over an extended period is not feasible in soilless culture due to the disease hazard (5). However, the same effect has been accomplished by the use of urea-form fertilizers prepared and made available by the Division of Fertilizer and Agricultural Lime of the Bureau of Plant Industry. (2).

Four preparations with urea-formaldehyde mol ratios of 1.15, 1.20, 1.27, and 1.31 (table 2) were used as the source of nitrogen for growing nine species of plants in subirrigated greenhouse bench sections containing Haydite. Each section was 8 feet long, 57 inches wide, and 7 inches deep. Two hundred liters of a complete nutrient solution, except for nitrogen, were pumped into each section twice daily. One hundred grams of the urea-form materials were added to the solution tanks on April 2, April 16, May 14, and June 11. Other elements were added to the tanks in amounts sufficient to provide for good growth. For comparison other sections were provided with the same nutrient solution and

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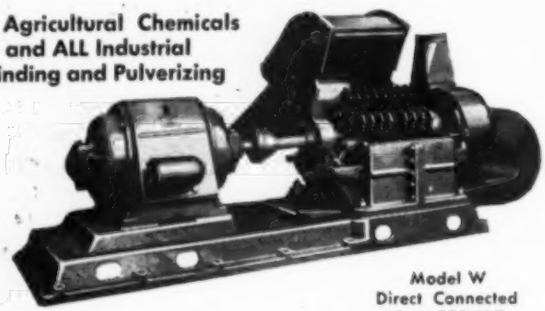

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Mul-si-mo, we believe, is the cheapest and most economical Emulsifier on the market for the emulsification of the oils above specified.

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Extensive tests have shown *Mul-si-mo* to be non-toxic to plants when used at a dilution of 1 to 100. (Plants used in tests —Coleus.) As summer oils are usually used at the dilution of half-gal. to 100 gals. water, at such dilution the rate of *Mul-si-mo* to water would be 1 to 20,000.

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Manufactured by:

ASSOCIATED CHEMISTS, INC. North Collins, N. Y.

70 p.p.m. of nitrogen from sodium nitrate and ammonium sulfate. Additions were made weekly to this solution until a total of 406 p.p.m. of nitrogen were added between April 8 and July 3. The nitrate nitrogen content of the solutions was determined photometrically by the phenoldisulfonic acid method at weekly intervals until the plants were in bloom and after they were harvested. These data are shown in table 3.

The data in table 3 show that more residual nitrate nitrogen was present in the solutions containing the higher mol ratios of urea-form, 1.27 and 1.31, than in the solutions with the lower ratios, 1.15 and 1.20. The plant weight data in table 4 confirm the fact that more nitrogen was available from the higher ratio urea-form than from the lower. The nitrogen in urea-form 1.15 and 1.20 was not sufficiently available for optimum plant growth. Urea-form 1.27 and 1.31, on the other hand, produced larger plants than did the inorganic nitrogen solution which was partially renewed every week.

After the plants were harvested on July 22 the nutrient solutions were pumped into the beds twice daily until August 26. Although no urea-form was added after June 11, nitrate nitrogen continued to accumulate in the nutrient solutions roughly in proportion to the mol ratios of the four materials. The nitrate content of the solution containing the urea-form with a mol ratio of 1.31 was lower than in the solution containing the 1.27 product on August 19 and 26, which suggests that the former had been more completely nitrified during the growth of the plants. The use of urea-form together with some inorganic nitrogen would seem desirable in soilless culture studies and should result in maximum growth with minimum adjustment of the solution.

Literature Cited

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5. McCellan, W. D. and Stuart, Neil W. The influence of nutrition on Fusarium basal rot of narcissus and Fusarium yellows of gladiolus. Amer. Jour. Bot. 34: 88-93. 1947.
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GRAIN STORAGE

(*Continued from Page 39*)

made but failed to reveal the presence of these pests in farm granaries. A single infestation of the granary weevil occurred near Winnipeg in "tough" grain in a large annex. Fumigation with chloropicrin resulted in complete control.

Indian Meal Moth

THESE two insects were responsible for considerable infestation of grain both in the Bay Port elevators and in elevators on the Pacific Coast. Light infestations were found in a few country annexes. The larval stage of these two pests fed on the germ portion of the kernel and when abundant, removed the germ from much of the surface grain. There are several generations annually and when grain remains in storage throughout the year, large populations can build up. Tests have shown that the degermed kernels produce flour inferior in baking quality to that produced from normal wheat. Infestations extended to a depth of from 4 to 6 feet below the surface.

Various methods of control were used. Fumigation with HCN in the form of "discoids" yielded good control of the moths and surface larvae, but the penetration into the grain was not very great. The method of application greatly affected the results secured with the heavier-than-air fumigants. When these were applied with a sprinking can to the surface grain, the fumigant sank rapidly below the site of infestation yielding only partial kills. Very satisfactory results were secured with chloropicrin against both adults and larvae by applying the fumigant with a sprayer to the space above the grain. While some penetration of the grain occurred, a satisfactory concentration was also maintained above the grain surface.

The most widely used method of control of the Indian meal moth was the use of a contact spray of 10 per cent extract of pyrethrum (.48 to .72 total pyrethrins) in a high grade oil carrier. This was applied to the space above the grain in the bins at the rate of 5 to 6 ounces per 1,000 cubic feet of space above the grain. Application was made by means of a portable electric sprayer or a compressed air sprayer such as is used for paint spraying. This control required careful inspection of the bins so that the first spray was applied shortly after the moths appeared in early summer. In most cases the bins were treated at least once a week as long as live insects could be found. The results were highly satisfactory, as persistent treatment has completely freed several elevators from these pests.

Conclusion

THE success which has attended our efforts in safeguarding grain in Canada during war years was the result of several factors:

1. Canada has very favorable climatic conditions for the storage of grain because of the short season in which pests can be active. Grain may be "turned" and cooled during cold weather and then safely stored for a considerable time.

2. The whole-hearted cooperation of the grain trade was secured in maintaining a constant check on grain stocks and in bringing their problems to the entomologist promptly.

3. Prompt action was taken to deal with insect problems as soon as they were detected: by fumigation, the use of contact sprays, or the movement and cleaning of the grain.

Industry Patents

2,448,405. XANTHONE-DDT INSECTICIDE. Patent issued August 31, 1948, to James F. Adams, Wilmington, Del., assignor to Allied Chemical & Dye Corp., New York. An insecticidal composition, the essential active ingredients of which are 2,2-bis, (parachlorophenyl)-1,1,1-trichloroethane and xanthone.

2,444,154. PARASITICIDAL COMPOSITION. PATENT issued June 29, 1948, to ROY CROSS, Kansas City, Mo., Assignor to Kansas City Testing Laboratory. A parasiticidal composition comprising a mixture of Florida-Georgia fuller's earth containing a substantial amount of its natural water of hydration, a water insoluble parasiticidal material, and a salt selected from the group consisting of the water soluble salts of the alkali metals and the alkaline earth metals, said salt being in sufficient amount to substantially facilitate the dispersion of the mixture in water and improve the suspension characteristics of the dispersion thus formed, said fuller's earth having dispersion characteristics such that the dispersion in water of less than about 10% but substantial quantities thereof produce a dispersion having a viscosity greater than about 5 centipoises.

2,448,661. METHOD OF PREPARING PARASITICIDES CONTAINING ALUMINUM HYDROXIDE. Patent issued September 7, 1948, to Homer L. Cupples, Alexandria, Va.; dedicated to the free use of the People in the territory of the United States. A process of preparing parasiticides comprising the mixing of xanthone, a vegetable gum, aluminum sulphate, water, and ammonium hydroxide, the latter three ingredients being in the proportion of about 60 milliliters of 10% aluminum sulphate, to about 2835 milliliters of water, to about 55 milliliters of ammonium hydroxide (specific gravity 0.90 diluted from one to ten volumes), thereby precipitating aluminum hydroxide in situ.

22,448,665. LOW-TEMPERATURE NONCRYSTALLIZING DDT-ALKYLATED NAPHTHALENE INSECTICIDE. Patent issued September 7, 1948, to Elmer E. Fleck, Silver Spring, and Robert K. Preston, Cumberland, Md.; dedicated to the free use of the people in the territory of the United States.

An insecticidal composition which will remain free from crystal formation of DDT at all temperatures between about—20°F. and 140°F. comprising a solution of about from 95 to 80 parts, by weight, of a kerosene mixture of DDT and about from 5 to 20 parts by weight, of substantially pure alkylated naphthalenes, said kerosene mixture containing about from 3 to 10 percent DDT.

2,446,836. HERBICIDES. Patent issued August 10, 1948, to Gladys S. King, Metairie, La., assignor to James M. Fountain, Bryan, Texas. A herbicide comprising a combination of two basic ingredients, the first of said ingredients being aryl substituted monocarboxylic compounds from the group consisting of acids of the formula:

AOCH(B) COOH

and

ACOCH (B) COOH

where A is a halogenated aryl radical and B is a radical from the group H—, methyl and ethyl; and the esters and salts of said acids, the second of said ingredients being a plant bud growth inhibitor from the group consisting of compounds having the formula:

$R(CH_2)_nCOOH$

and

RCH=CHCOOH

where R is a radical from the group phenyl, naphthyl and indolyl, and n is an integer from 1 to 4.

2,448,126. GRANULATED SUPERPHOSPHATE MANUFACTURE. Patent issued August 31, 1948, to Mark Shoeld, Baltimore, Md., assignor to the Davison Chemical Corp., Baltimore. A method of manufacturing superphosphate comprising finely divided phosphate rock with an acid selected from the group consisting of sulphuric acid, phosphoric acid and a mixture of sulphuric and phosphoric acids and with a coarse fraction of superphosphate fines to form a thick slurry, discharging the slurry onto a conveyor belt coated with fine superphosphate fines discharging the slurry together with the fine fines into a conditioning and nodulizing zone, nodulizing the mixture of slurry and fine fines, drying the nodulized material in a drying zone and cooling the dry nodulized material.

2,448,265. PROTECTION OF CROPS BY SOIL FUMIGATION. Patent issued August 31, 1948, to John F. Kagy and Robert R. McPherson, Long Beach California, assignors to the Dow Chemical Co., Midland, Mich.

A method for protecting the underground parts of crops against attack by soil-inhabiting invertebrates which includes the steps of treating the soil with a liquid composition comprising ethylene bromide as a principal toxic ingredient, and at a dosage of at least 10 pounds of ethylene bromide per acre, and thereafter planting the treated soil.

2,449,028. PROCESS OF COMMINUTING IMPURE DDT. Patent issued September 7, 1948, to I. F. Walker, Hockessin, Del., assignor to E. I. duPont de Nemours & Co., Inc., Wilmington, Del.

A process which comprises comminuting in a high velocity gas disintegrator impure 1,1,1,trichloro-2,2-bis (p-chlorophenyl) ethane having a setting point of from 102 to 106° C. in the presence of a salt of an acid having an ionization constant of at least $3x10^{-7}$ at 25°C.

Trade Mark Applications

BT 4, in capital letters, for calcium and phosphate preparation. Filed Dec. 8, 1947, by Ralph I. Guy, doing business as the Rig Company.

Glendale, Calif. Claims use since Jan. 10, 1936.

DI-CHLOR-MULSION, in gothic capital letters, for insecticide. Filed June 2, 1947 by Woolfolk Chemical Works, Ltd., Ft. Valley, Fla. Claims use since September, 1938.

FLYING HORSE EMBLEM, for insecticides and base oils used as insecticides and base oils used as insecticide carriers. Filed June 25, 1947, by Socony-Vacuum Oil Co., Inc., New York. Claims use since Oct. 15, 1934.

MILLERS RELIEF, in stencil capital letters, for chlorinated hydrocarbon fumigant used for spot fumigation of mill machinery, in vaults, warehouses, etc. Filed Nov. 25, 1947, by Huntington Laboratories, Inc., Huntington, Ind. Claims use since Jan. 15, 1924.

BENZAHEX, in sans serif capital letters, for agricultural insecticides and fungicides. Filed Oct. 4, 1947, by Chipman Chemical Co., inc., Bound Brook, N. J. Claims use since Sept. 17, 1947.

HSPA ACTIVATOR, in thin capital letters, for herbicides. Filed Oct. 27, 1947, by Monsanto Chemical Co., St. Louis. Claims use since Oct. 15, 1947.

IMPREGNO, in thin capital letters, for insecticide concentrate. Filed Jan. 10, 1948, by S. B. Penick & Co., New York. Claims use since June 1, 1939.

PYREXCEL 20, in capital letters, for insecticide concentrate as a constituent in the manufacture of insecticides. Filed Jan. 10, 1948, by S. B. Penick & Co., New York. Claims use since Sept. 20, 1946.

INSTO, in hollow capital letters, set on an arc, for insecticides. Filed Feb. 7, 1948, by Bacon Products Co., Chattanooga, Tenn. Claims use since Jan. 21, 1948.

HORTI-FEREZ, in capital letters, set on two lines. For fertilizer. Filed Feb. 9, 1948, By Tennessee Corporation, New York. Claims use since Mar. 1, 1939.

AGRI-MINS, in capital letters for fertilizers. Filed Feb. 17, 1948, by Agricultural Minerals Co., Montgomery, Alabama. Claims use since Dec. 15, 1947.

WEED-NO-MORE, in capital letters, underlined, for chemicals for exterminating weeds. Filed Oct. 29, 1947, by the Sherwin-Williams Co., Cleveland, Ohio. Claims use since Feb. 26, 1946.

W-N-M, WEED-NO-MORE, with motif of wilting plant leaf, for chemicals for exterminating weeds. Filed Nov. 12, 1947, by the Sherwin-Williams Co., Cleveland, Ohio. Claims use since Feb. 1, 1947.

CROWN, in hand-lettered capitals, set on an arc, for sulfur. Filed Jan. 22, 1948, by Stauffer Chemical Co., San Francisco, Calif. Claims use since Aug. 5, 1924.

STR, with all three letters joining, for wire ties adapted for tying bags. Filed Aug. 22, 1947, by St. Regis Paper Co., New York. Claims use since Mar. 15, 1947.

SPENSOL, in black capital letters, for nitrogen solution—namely, a solution of ammonium nitrate in ammonium liquor for use in the manufacture of fertilizer. Filed July 5, 1947, by Spencer Chemical Co., Kansas City, Mo. Claims use since May 16, 1947.

KALO, in hand-lettered, interlocking capital letters within oval, for insecticides. Filed Nov. 12, 1947, by Agkem, Inc., Quincy, Ill. Claims use since 1914.

CMC, in hollow capital letters, within wide diamond-shaped box, for carboxymethyl cellulose for use as an ingredient of thickening agents, emulsion stabilizers, etc. Filed Dec. 3, 1947, by Hercules Powder Co., Wilmington, Del. Claims use since Nov. 14, 1947.

TRIONA, in heavy capital letters for insecticides used as garden and orchard sprays. Filed Apr. 10, 1948, by Shell Oil Co., Inc., San Francisco. Claims use since June 10, 1925.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word. $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of AGRICULTURAL CHEMICALS, 254 W. 31st St., New York 1. Closing date: 25th of preceding month.

Positions Open

Plant Manager Open for young agricultural chemical concern in Denver, engaged in mixing insecticides, herbicides and fungicides. Knowledge of formulations and sources essential. Wide growth and expansion possible. Address Box 292, care of Agricultural Chemicals.

Salesman Wanted: Progressive leader in the insecticide field requires young, energetic man with sales background for New Jersey territory. Salesman will work under close, friendly but exacting supervision. Unusual opportunity for lifetime career. Experience in this line helpful. Full details first letter. Address box 295 care of Agricultural Chemicals.

Positions Wanted

Salesman—Young man, 26, three years in sales of chemicals, solvents, aromatics for manufacturing organization desires new connection in sales department of manufacturer. College graduate. Interested in position with future possibilities. Address Box 283, care of Agricultural Chemicals.

Product Dev—Sales Field. Yale graduate, age 27, interested in agricultural field. Heavy background in fruit cultivation methods-machinery-biological sciences. Also project work. Address Box 289, care of Agricultural Chemicals.

Agriculturalists (2): Engaged in the educational field, desires change of employment. Offers thorough knowledge in farm and estate problems, i.e., soils, use and application of insecticides, fungicides, hormones, weed killers, minor elements, etc. Extensive experience in field of fruit, berries, vegetables, field crops, flowers and nursery. Excellent references. Address Box 290, care of Agricultural Chemicals.

Agricultural Chemical Salesman, Graduate chemist, 3 yrs. in research. Wide experience in agricultural chemicals sales promotion and direct sales in mid-south and southwest. Desires junior executive sales position with established concern, willing to travel. Has good contacts with experiment stations and agricultural chemical outlets in above areas. Address Box 291, care of Agricultural Chemicals.

Miscellaneous

Wanted Business. Chemicals, fertilizers, insecticides, veterinary supplies, feeds or seeds, manufacturing, wholesale or retail, by live wire sales manager now employed. Present volume of business secondary. Outright purchase or partnership or similar arrangements considered. All correspondence strictly confidential. Address Box 293, care of Agricultural Chemicals.

For Sale—Tonnage of laundry soap, 66% fatty acids, packed solid in 450 lb. fiber drums. Price carloads fob eastern point 5½c lb. Suitable insecticide, fungicide spreader or other industrial use or for export. For sample and further information write to Box 294, care of Agricultural Chemicals.

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Co-op Has Housewarming

A housewarming for the new Winchester, Ky. fertilizer plant was to be held on September 24, according to Southern States Cooperative, Richmond, Va., operator of the new enterprise. The program called for a guided tour of the plant, and talks by Alec Calvert, Mays Lick, Ky., vice-president of the co-op; H. H. Gordon, assistant general manager of the group; J. E. Stanford, executive secretary of the Kentucky Farm Bureau Federation; and W. T. Steele, Jr., director of wholesale services for Southern States. A number of prizes were to be awarded, including a ton of ammonium nitrate; a ton of 20 percent superphosphate; one-half ton of 0-12-12 fertilizer; a half ton of 20 percent superphosphate; and a prize of 300 pounds of granular cyanamid, and other smaller awards.

•

Cavanagh Nominated

Joseph Cavanagh, recently retired head of the Agricultural Chemical Sales Division of the Dow Chemical Co., Midland, Mich. is the Republican nominee for state representative for the Midland district in the Michigan State Legislature. He won the nomination in a hotly-contested primary election held September 14. Inasmuch as no nomination has been made for this district by the Democrats, the election of Mr. Cavanagh in November is stated to be virtually assured. Mr. Cavanagh continues to act in a consulting capacity for the Dow Agricultural Chemical Sales Division of which W. W. Allen is now the manager.

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Morgan Becomes VP

Dr. D. P. Morgan has been appointed vice president in charge of the Development Department of Mathieson Chemical Corp., New York, the company has announced. Dr. Morgan was formerly with the W. R. Grace Co., and during World War 11, served as Director of the Chemicals Bureau of the War Production Board. He holds degrees from Harvard and Columbia.

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Agronomy Meeting Held

Firman E. Bear, New Jersey Agricultural Experiment Station, was elected president of the American Society of Agronomy, and Hans Jenny of California was named president of the Soil Science Society of America at the joint meeting of the two groups, Ft. Collins, Colorado, August 24-27. O. S. Aamodt, Bureau of Plant Industry, Soils, and Agricultural Engineering, U.S.D.A., presided at the general Agronomy Society meetings, and N. J. Volk, Indiana Agricultural Experiment Station, presided at the general program of the SSSA. Numerous technical papers were given, and the two groups voted to hold a joint meeting in 1949 at Milwaukee, Wisconsin. The date is set for October 26-28.

CFA Votes on Directors

A nominating committee has been named by the California Fertilizer Association to choose candidates for three vacancies on the Association's board of directors. The new committee is composed of Messrs. Ned Lewis, Southwestern Supply Co., Los Angeles; J. M. Quinn, California Sun Fertilizer Co., Los Angeles; and Byron Reynolds, Bandini Fertilizer Co., Ontario, Calif.

The committee was to meet before October 1 to select one nominee for each of three vacancies caused by the ending of terms of office of Mr. Lewis, Wallace McFarlane, Pacific Guano Co., Berkeley, Calif; and Earl Mog, Growers Fertilizer Co., San Francisco. Each active member of the Association was to be notified of the choices before the annual convention.

Plans were nearing completion for the convention as this issue went to press late in September, according to Oliver E. Overseth, Executive Secretary and Manager. The dates of the meeting were set for October 18 and 19, and the place was Mission Inn, Riverside, California.

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Improves Service

Hayes-Sammons Co., Mission, Texas, reports a successful experiment in a free inspection and consultation service in connection with its insecticide, fungicide and fertilizer sales. The addition to its staff of Clay Brazeal and Guy Carpenter, entomologists, who were graduated from Texas A and M College last June, made possible this service to the firm's customers.

The pair make inspections of fields, consult with farmers, and recommend both the type of insecticide to use, and proper application procedures. They also check on results obtained and keep records of how various toxicants perform.

The company has pioneered insecticide work in the area for the past 30 years, providing pest control materials for growers of cotton, vegetables, fruit, and other crops. Its products are distributed on a statewide basis throughout Texas.

Advertisers' Index

(The Advertisers' Index has been carefully checked but no responsibility can be assumed for any omission.)

TALE ENDS

A UNIQUE manner of merchandising herbicides has proved successful to the McMahon Co., Inc., of Rapid City, S. Dakota, dealers in farm supplies. A believer in demonstrative advertising in addition to other media, the firm's proprietor has acquired the use of a main street vacant lot, for years known to the townspeople as an overgrown weed

patch, to demonstrate the herbicidal properties of 2,4-D. The entire lot was given a generous application of the material, and a sign was posted in the midst of the area, " 'WEEDONE' TREATED—WATCH THE WEEDS DIE. Inquire McMahon Co."

The response to this graphic display, as well as to other local advertising and publicity has warranted the enlarging of the store's agricultural chemical sales division into a separate department.

A bulletin board in the store displays dozens of unsolicited testimonial letters from customers endorsing various chemical products they have used and found successful; covering the fields of cattle spraying, weed killers, and insecticides.

The store, established more than 50 years ago, has watched with interest the development of chemicals on the farm. In 1945 the firm began a systematic program of merchandising of such products on a small scale, and has increased its volume continually since.

WATKINS PRINTING CO., BALTIMORE

OX-WARBLE FLY

(Hypoderma Pineatum)

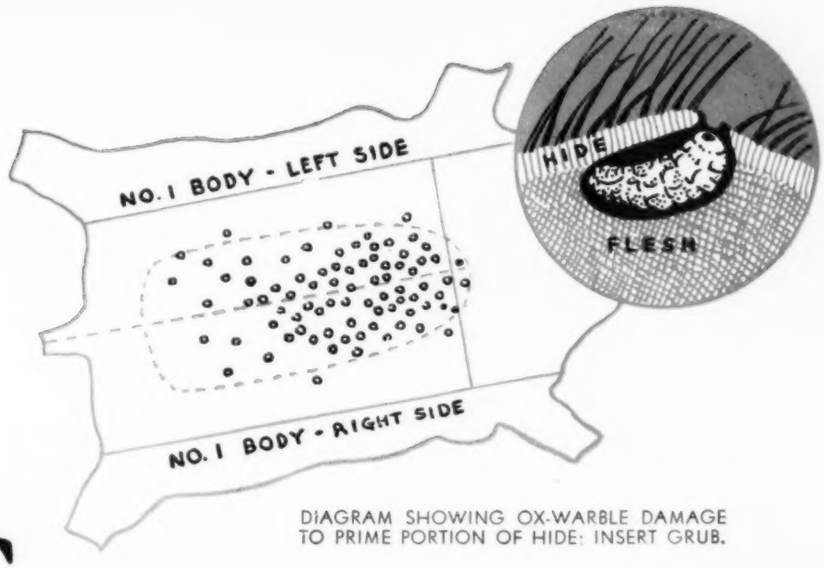


DIAGRAM SHOWING OX-WARBLE DAMAGE TO PRIME PORTION OF HIDE: INSERT GRUB.

BUG OF THE MONTH

...controlled with Rotenone

The loss from these insects—in terms of lowered vitality, reduced weight, low-grade beef and worthless hides—is estimated to be in excess of $100,000,000.* The heel fly and its relative, the bomb fly, have infested an estimated 75% of our cattle.

Eggs, laid on the hairs of heel and underbelly, develop into tiny larvae which tunnel into the animal and feed on its vital tissues for nine months, finally locating on the back. There the ½ to ¾ inch grubs cut breathing holes through the hide and spend the last 60 to 75 days maturing into ripe pupae.

The most effective treatment is a dust, spray or dip containing rotenone. Applied liberally as soon in the fall as the first lumps appear and every 30 days thereafter, it kills the larvae and permits the grub-holes to heal.

For such preparations, there is no better form of rotenone than Prentox Cubé Powder. Its exceptional quality has made Prentiss the largest producer of rotenone powders in the United States. Each batch, assayed for potency, is ground to uniform fineness, then screened to produce a completely fiber-free powder. Finally, it is blended to uniformity, and sold on the basis of guaranteed rotenone content.

For cubé or any agricultural insecticide concentrate, Prentiss' manufacturing facilities and technical knowledge are at your disposal. Your inquiries are invited.

*National Live Stock Loss Prevention Board.

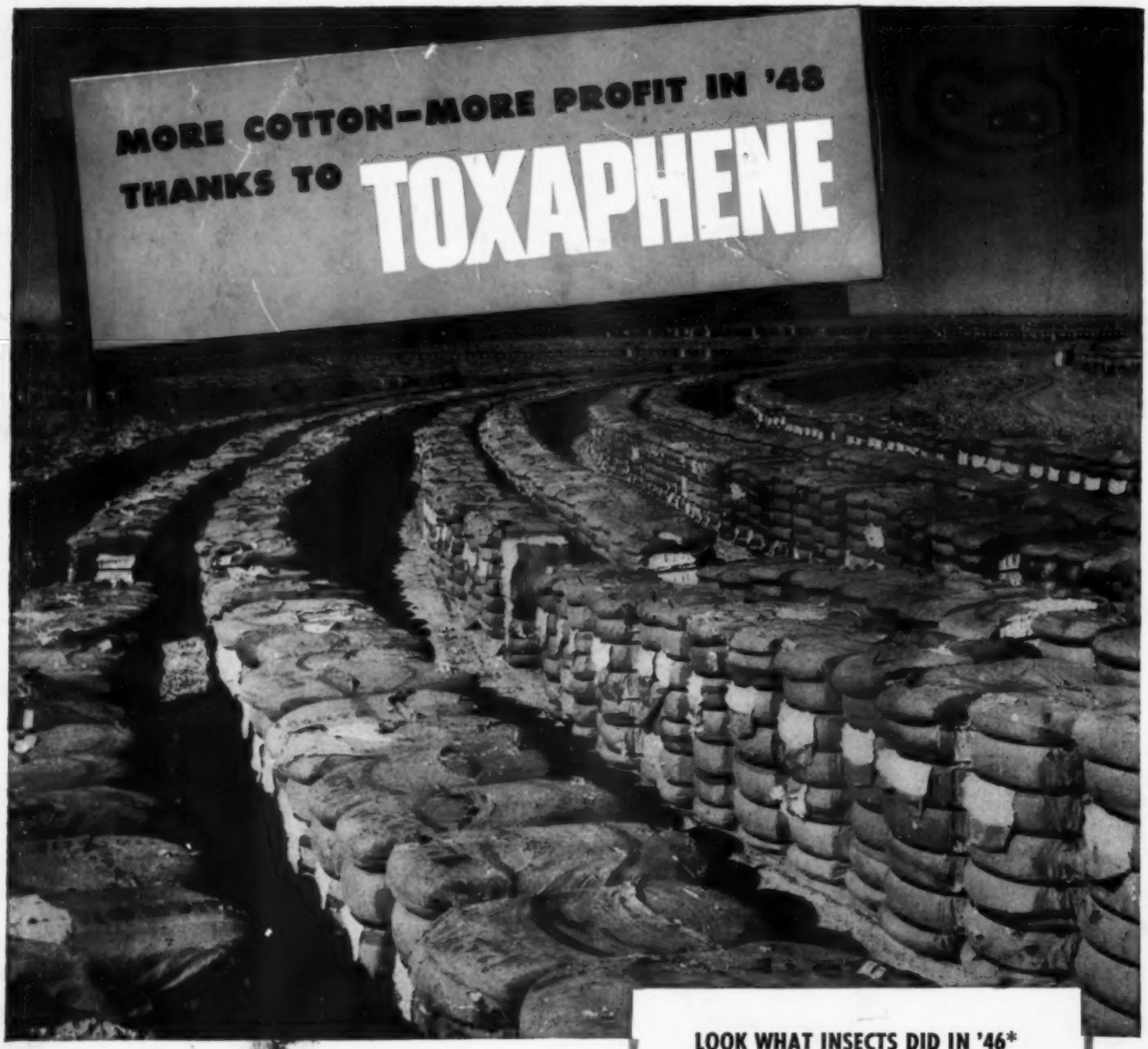
R. J. PRENTISS & CO., Inc.

110 WILLIAM STREET, NEW YORK 7, N. Y.

9 SO. CLINTON STREET, CHICAGO 6, ILL.

PRENTOX PEST-TESTED CONCENTRATES SOLD TO INSECTICIDE MANUFACTURERS ONLY

DDT CONCENTRATES • SABADILLA DUST CONCENTRATE • PYRETHRUM PRODUCTS • CHLORDANE CONCENTRATES • BENZENE HEXACHLORIDE



Thousands of acres of cotton have been treated effectively with Toxaphene (Chlorinated Camphene) this year. Millions of boll weevils, leafworms, fleahoppers, aphids, grasshoppers, thrips and other harmful insects have been stopped in their tracks by this new cotton poison.

LOOK WHAT INSECTS DID IN '46*

- The estimated money value of crop losses to cotton insects in 1946 was $283,595,000.
- This loss increased the cost of production almost to $.06 per pound of lint.
- Loss in bales was 1,537,000 lbs., 613,000 tons of seed.
- This seed would have produced 200,000,000 pounds of margarine, or 179,000,000 pounds of shortening or cooking oil.
- The cottonseed meal and hulls would have produced 178,000,000 pounds of beef, or 500,000,000 gallons of milk.

**Statistics from National Cotton Council of America.*

HERCULES POWDER COMPANY
INCORPORATED
970 Market Street, Wilmington 99, Delaware

HERCULES
TOXAPHENE
(CHLORINATED CAMPHENE—67-69% Chlorine)